



OM-281496K

2020-06

### Processes



Stick (SMAW) Welding



TIG (GTAW) Welding



MIG (GMAW) Welding



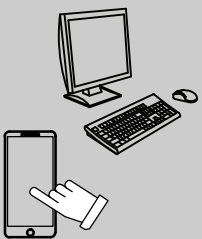
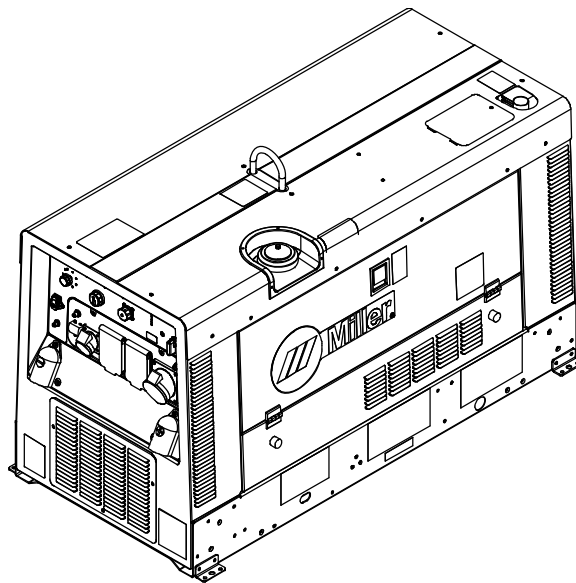
Flux Cored (FCAW) Welding



Air Carbon Arc (CAC-A) Cutting and Gouging

# Big Blue<sup>®</sup> 400 X Pro

## CAT, Kubota



For product information,  
Owner's Manual translations,  
and more, visit

[www.MillerWelds.com](http://www.MillerWelds.com)

# OWNER'S MANUAL

# From Miller to You

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*Thank you and congratulations* on choosing Miller. Now you can get the job done and get it done right. We know you don't have time to do it any other way.

That's why when Niels Miller first started building arc welders in 1929, he made sure his products offered long-lasting value and superior quality. Like you, his customers couldn't afford anything less. Miller products had to be more than the best they could be. They had to be the best you could buy.

Today, the people that build and sell Miller products continue the tradition. They're just as committed to providing equipment and service that meets the high standards of quality and value established in 1929.

This Owner's Manual is designed to help you get the most out of your Miller products. Please take time to read the Safety Precautions. They will help you protect yourself against potential hazards on the worksite. We've made installation and operation quick and easy. With Miller, you can count on years of reliable service with proper maintenance. And if for some reason the unit needs repair, there's a Troubleshooting section that will help you figure out what the problem is, and our extensive service network is there to help fix the problem. Warranty and maintenance information for your particular model are also provided.

Miller Electric manufactures a full line of welders and welding-related equipment. For information on other quality Miller products, contact your local Miller distributor to receive the latest full line catalog or individual specification sheets. **To locate your nearest distributor or service agency call 1-800-4-A-Miller, or visit us at [www.MillerWelds.com](http://www.MillerWelds.com) on the web.**



Working as hard as you do – every power source from Miller is backed by the most hassle-free warranty in the business.



ISO 9001  
Quality

Miller is the first welding equipment manufacturer in the U.S.A. to be registered to the ISO 9001 Quality System Standard.





# DECLARATION OF CONFORMITY

for European Community (CE marked) products.

**MILLER Electric Mfg. Co., 1635 Spencer Street, Appleton, WI 54914 U.S.A. declares that the product(s) identified in this declaration conform to the essential requirements and provisions of the stated Council Directive(s) and Standard(s).**

Product/Apparatus Identification:

Product	Stock Number
Big Blue 400X Pro (Kubota)	907732-010
Big Blue 400X Pro (Kubota W. Arc Reach)	907732-011

Council Directives:

- 2014/35/EU Low voltage
- 2014/30/EU Electromagnetic compatibility
- 2015/865/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment
- 2000/14/EC & 2005/88/EC Outdoor noise
  - Conformity Assessment Procedure Followed: Annex VI, 2000/14/EC
  - Technical Document Holder: Manufacturer
  - Notified Body Evaluation Report No: NBER-MILLER-001-Rev-1-00
    - Measured Sound Power level: 96 dB  $L_{WA}$
    - Guaranteed Sound Power Level: 97 dB  $L_{WA}$
    - Electric Power  $P_{eL}$ : 9.6 kW

Standards:

- IEC 60974-1:2012 Arc welding equipment – Part 1: Welding power sources
- IEC 60974-10:2014 Arc welding equipment – Part 10: Electromagnetic compatibility requirements

Signatory:

**David A. Werba**  
MANAGER, PRODUCT DESIGN COMPLIANCE

June 12, 2020  
Date of Declaration



# EMF DATA SHEET FOR ARC WELDING POWER SOURCE

## Product/Apparatus Identification

Product	Stock Number
BIG BLUE 500 X PRO (PERKINS) CE W/ ARCREACH	907761
BIG BLUE 400 X PRO (KUBOTA) CE	907732010
BIG BLUE 400 X PRO (KUBOTA) CE W/ ARCREACH	907732011
BIG BLUE 400 X PRO (CAT) CE	907758

## Compliance Information Summary

Applicable regulation                      Directive 2014/35/EU

Reference limits                              Directive 2013/35/EU, Recommendation 1999/519/EC

Applicable standards                        IEC 62822-1:2016, IEC 62822-2:2016

Intended use                                   for occupational use                       for use by laymen

Non-thermal effects need to be considered for workplace assessment                       YES                       NO

Thermal effects need to be considered for workplace assessment                       YES                       NO

Data is based on maximum power source capability (valid unless firmware/hardware is changed)

Data is based on worst case setting/program (only valid until setting options/welding programs are changed)

Data is based on multiple settings/programs (only valid until setting options/welding programs are changed)

Occupational exposure is below the Exposure Limit Values (ELVs) for health effects at the standardized configurations                       YES                       NO  
(if NO, specific required minimum distances apply)

Occupational exposure is below the Exposure Limit Values (ELVs) for sensory effects at the standardized configurations                       n.a                       YES                       NO  
(if applicable and NO, specific measures are needed)

Occupational exposure is below the Action Levels (ALs) at the standardized configurations                       n.a                       YES                       NO  
(if applicable and NO, specific signage is needed)

## EMF Data for Non-thermal Effects

Exposure Indices (EIs) and distances to welding circuit (for each operation mode, as applicable)

	Head		Trunk	Limb (hand)	Limb (thigh)
	Sensory Effects	Health Effects			
Standardized distance	10 cm	10 cm	10 cm	3 cm	3 cm
ELV EI @ standardized distance	0.16	0.11	0.18	0.10	0.23
Required minimum distance	1 cm	1 cm	1 cm	1 cm	1 cm

Distance where all occupational ELV Exposure Indices fall below 0.20 (20%)                      8 cm

Distance where all general public ELV Exposure Indices fall below 1.00 (100%)                      182 cm

Tested by:      Tony Samimi                      Date tested:      2016-02-22

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 **WARNING – Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.**

- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to [www.P65warnings.ca.gov/diesel](http://www.P65warnings.ca.gov/diesel).


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# SECTION 1 – SAFETY PRECAUTIONS – READ BEFORE USING

 Protect yourself and others from injury—read, follow, and save these important safety precautions and operating instructions.

## 1-1. Symbol Usage

 **DANGER!** – Indicates a hazardous situation which, if not avoided, will result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

 Indicates a hazardous situation which, if not avoided, could result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.


**NOTICE** – Indicates statements not related to personal injury.


 Indicates special instructions.




This group of symbols means Warning! Watch Out! ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid these hazards.

## 1-2. Arc Welding Hazards

 The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Principal Safety Standards listed in Section 1-7. Read and follow all Safety Standards.

 Only qualified persons should install, operate, maintain, and repair this equipment. A qualified person is defined as one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project and has received safety training to recognize and avoid the hazards involved.

 During operation, keep everybody, especially children, away.



### ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.



- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC weld output in damp, wet, or confined spaces, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- Additional safety precautions are required when any of the following electrically hazardous conditions are present: in damp locations or while wearing wet clothing; on metal structures such as floors, gratings, or scaffolds; when in cramped positions such as sitting, kneeling, or lying; or when there is a high risk of unavoidable or accidental contact with the workpiece or ground. For these conditions, use the following equipment in order presented: 1) a semiautomatic DC constant voltage (wire) welder, 2) a DC manual (stick) welder, or 3) an AC welder with reduced open-circuit voltage. In most situations, use of a DC, constant voltage wire welder is recommended. And, do not work alone!

- Do not connect to any electrical distribution system normally supplied by utility power unless a proper transfer switch and grounding procedure are employed.
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install, ground, and operate this equipment according to its Owner's Manual and national, state, and local codes.
- Always verify the supply ground — check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first — double-check connections.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- Frequently inspect input power cord and ground conductor for damage or bare wiring — replace immediately if damaged — bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or repaired cables.
- Do not drape cables over your body.
- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Do not touch electrode holders connected to two welding machines at the same time since double open-circuit voltage will be present.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal. Disconnect cable for process not in use.
- Use GFCI protection when operating auxiliary equipment. Test GFCI receptacles at high speed.

**SIGNIFICANT DC VOLTAGE exists in inverter power sources AFTER stopping engine.**

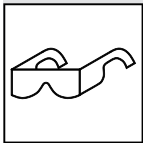
- Stop engine on inverter and discharge input capacitors according to instructions in Manual before touching any parts.



### HOT PARTS can burn.

- Do not touch hot parts bare handed.
- Allow cooling period before working on equipment.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to

prevent burns.



### FLYING METAL OR DIRT can injure eyes.

- Welding, chipping, wire brushing, and grinding cause sparks and flying metal. As welds cool, they can throw off slag.

- Wear approved safety glasses with side shields even under your welding helmet.



### FUMES AND GASES can be hazardous.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

- Keep your head out of the fumes. Do not breathe the fumes.
- Ventilate the work area and/or use local forced ventilation at the arc to remove welding fumes and gases. The recommended way to determine adequate ventilation is to sample for the composition and quantity of fumes and gases to which personnel are exposed.
- If ventilation is poor, wear an approved air-supplied respirator.
- Read and understand the Safety Data Sheets (SDSs) and the manufacturer's instructions for adhesives, coatings, cleaners, consumables, coolants, degreasers, fluxes, and metals.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watchperson nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.



### BUILDUP OF GAS can injure or kill.

- Shut off compressed gas supply when not in use.
- Always ventilate confined spaces or use approved air-supplied respirator.



### ARC RAYS can burn eyes and skin.

Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

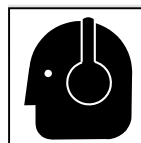
- Wear an approved welding helmet fitted with a proper shade of filter lenses to protect your face and eyes from arc rays and sparks when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash, glare, and sparks; warn others not to watch the arc.
- Wear body protection made from durable, flame-resistant material (leather, heavy cotton, wool). Body protection includes oil-free clothing such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.



### WELDING can cause fire or explosion.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.

- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Do not weld where flying sparks can strike flammable material.
- Protect yourself and others from flying sparks and hot metal.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not cut or weld on tire rims or wheels. Tires can explode if heated. Repaired rims and wheels can fail. See OSHA 29 CFR 1910.177 listed in Safety Standards.
- Do not weld on containers that have held combustibles, or on closed containers such as tanks, drums, or pipes unless they are properly prepared according to AWS F4.1 and AWS A6.0 (see Safety Standards).
- Do not weld where the atmosphere can contain flammable dust, gas, or liquid vapors (such as gasoline).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock, sparks, and fire hazards.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear body protection made from durable, flame-resistant material (leather, heavy cotton, wool). Body protection includes oil-free clothing such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.
- After completion of work, inspect area to ensure it is free of sparks, glowing embers, and flames.
- Use only correct fuses or circuit breakers. Do not oversize or bypass them.
- Follow requirements in OSHA 1910.252 (a) (2) (iv) and NFPA 51B for hot work and have a fire watcher and extinguisher nearby.
- Read and understand the Safety Data Sheets (SDSs) and the manufacturer's instructions for adhesives, coatings, cleaners, consumables, coolants, degreasers, fluxes, and metals.



### NOISE can damage hearing.

Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.



### ELECTRIC AND MAGNETIC FIELDS (EMF) can affect Implanted Medical Devices.

- Wearers of Pacemakers and other Implanted Medical Devices should keep away.

- Implanted Medical Device wearers should consult their doctor and the device manufacturer before going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations.





### CYLINDERS can explode if damaged.

Compressed gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

- Protect compressed gas cylinders from excessive heat, mechanical shocks, physical damage, slag, open flames, sparks, and arcs.
- Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- Keep cylinders away from any welding or other electrical circuits.
- Never drape a welding torch over a gas cylinder.
- Never allow a welding electrode to touch any cylinder.

- Never weld on a pressurized cylinder — explosion will result.
- Use only correct compressed gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
- Turn face away from valve outlet when opening cylinder valve. Do not stand in front of or behind the regulator when opening the valve.
- Keep protective cap in place over valve except when cylinder is in use or connected for use.
- Use the proper equipment, correct procedures, and sufficient number of persons to lift, move, and transport cylinders.
- Read and follow instructions on compressed gas cylinders, associated equipment, and Compressed Gas Association (CGA) publication P-1 listed in Safety Standards.

## 1-3. Engine Hazards



### BATTERY EXPLOSION can injure.

- Always wear a face shield, rubber gloves, and protective clothing when working on a battery.
- Stop engine before disconnecting or connecting battery cables, battery charging cables (if applicable), or servicing battery.

- Do not allow tools to cause sparks when working on a battery.
- Do not use welder to charge batteries or jump start vehicles unless the unit has a battery charging feature designed for this purpose.
- Observe correct polarity (+ and -) on batteries.
- Disconnect negative (-) cable first and connect it last.
- Keep sparks, flames, cigarettes, and other ignition sources away from batteries. Batteries produce explosive gases during normal operation and when being charged.
- Follow battery manufacturer's instructions when working on or near a battery. See Battery Service Manual (listed in Safety Standards) for additional information.



### EXHAUST SPARKS can injure.

- Do not let engine exhaust sparks cause fire.
- Use approved engine exhaust spark arrestor in required areas — see applicable codes.



### HOT PARTS can burn.

- Do not touch hot parts bare handed.
- Allow cooling period before working on equipment.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to

prevent burns.



### STEAM AND HOT COOLANT can burn.

- If possible, check coolant level when engine is cold to avoid scalding.

- Always check coolant level at overflow tank, if present on unit, instead of radiator (unless told otherwise in maintenance section or engine manual).

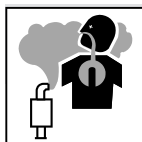
- If the engine is warm, checking is needed, and there is no overflow tank, follow the next two statements.
- Wear safety glasses and gloves and put a rag over radiator cap.
- Turn cap slightly and let pressure escape slowly before completely removing cap.



### FUEL can cause fire or explosion.

- Stop engine and let it cool off before checking or adding fuel.
- Do not add fuel while smoking or if unit is near any sparks or open flames.

- Do not overfill tank — allow room for fuel to expand.
- Do not spill fuel. If fuel is spilled, clean up before starting engine.
- Dispose of rags in a fireproof container.
- Always keep nozzle in contact with tank when fueling.



### Using a generator indoors CAN KILL YOU IN MINUTES.

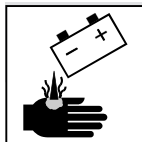
- Generator exhaust contains carbon monoxide. This is a poison you cannot see or smell.
- NEVER use inside a home or garage, EVEN IF doors and windows are open.
- Only use OUTSIDE and far away from windows, doors, and vents.



### MOVING PARTS can injure.

- Keep away from moving parts such as fans, belts, and rotors.
- Keep all doors, panels, covers, and guards closed and securely in place.

- Stop engine before installing or connecting unit.
- Have only qualified persons remove doors, panels, covers, or guards for maintenance and troubleshooting as necessary.
- To prevent accidental starting during servicing, disconnect negative (-) battery cable from battery.
- Keep hands, hair, loose clothing, and tools away from moving parts.
- Reinstall doors, panels, covers, or guards when servicing is finished and before starting engine.
- Before working on generator, remove spark plugs or injectors to keep engine from kicking back or starting.
- Block flywheel so that it will not turn while working on generator components.



### BATTERY ACID can BURN SKIN and EYES.

- Do not tip battery.
- Replace damaged battery.
- Flush eyes and skin immediately with water.



### ENGINE HEAT can cause fire.

- Do not locate unit on, over, or near combustible surfaces or flammables.
- Keep exhaust and exhaust pipes way from flammables.

## 1-4. Compressed Air Hazards



### COMPRESSED AIR EQUIPMENT can injure or kill.

- Incorrect installation or operation of this unit could result in equipment failure and personal injury. Only qualified persons should install, operate, and service this unit according to its Owner's Manual, industry standards, and national, state, and local codes.
- Do not exceed the rated output or capacity of the compressor or any equipment in the compressed air system. Design compressed air system so failure of any component will not put people or property at risk.
- Before working on compressed air system, turn off and lockout/tagout unit, release pressure, and be sure air pressure cannot be accidentally applied.
- Do not work on compressed air system with unit running unless you are a qualified person and following the manufacturer's instructions.
- Do not modify or alter compressor or manufacturer-supplied equipment. Do not disconnect, disable, or override any safety equipment in the compressed air system.
- Use only components and accessories approved by the manufacturer.
- Keep away from potential pinch points or crush points created by equipment connected to the compressed air system.
- Do not work under or around any equipment that is supported only by air pressure. Properly support equipment by mechanical means.



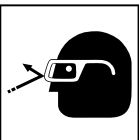
### HOT METAL from air arc cutting and gouging can cause fire or explosion.

- Do not cut or gouge near flammables.
- Watch for fire; keep extinguisher nearby.



### COMPRESSED AIR can injure or kill.

- Before working on compressed air system, turn off and lockout/tagout unit, release pressure, and be sure air pressure cannot be accidentally applied.
- Relieve pressure before disconnecting or connecting air lines.
- Check compressed air system components and all connections and hoses for damage, leaks, and wear before operating unit.
- Do not direct air stream toward self or others.



- Wear protective equipment such as safety glasses, hearing protection, leather gloves, heavy shirt and trousers, high shoes, and a cap when working on compressed air system.
- Use soapy water or an ultrasonic detector to search for leaks—never use bare hands. Do not use equipment if leaks are found.

- Reinstall doors, panels, covers, or guards when servicing is finished and before starting unit.
- If ANY air is injected into the skin or body seek medical help immediately.



### BREATHING COMPRESSED AIR can injure or kill.

- Do not use compressed air for breathing.
- Use only for cutting, gouging, and tools.



### TRAPPED AIR PRESSURE AND WHIPPING HOSES can injure.

- Release air pressure from tools and system before servicing, adding or changing attachments, or opening compressor oil drain or oil fill cap.



### MOVING PARTS can injure.

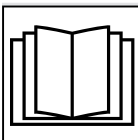
- Keep away from moving parts such as fans, belts and rotors.
- Keep all doors, panels, covers, and guards closed and securely in place.
- Keep hands, hair, loose clothing, and tools away from moving parts.
- Before working on compressed air system, turn off and lockout/tagout unit, release pressure, and be sure air pressure cannot be accidentally applied.
- Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
- Reinstall doors, panels, covers, or guards when servicing is finished and before starting engine.



### HOT PARTS can burn.

- Do not touch hot compressor or air system parts.
- Allow cooling period before working on equipment.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to

prevent burns.



### READ INSTRUCTIONS.

- Read and follow all labels and the Owner's Manual carefully before installing, operating, or servicing unit. Read the safety information at the beginning of the manual and in each section.

- Use only genuine replacement parts from the manufacturer.
- Perform installation, maintenance, and service according to the Owner's Manuals, industry standards, and national, state, and local codes.

## 1-5. Additional Hazards For Installation, Operation, And Maintenance



### FIRE OR EXPLOSION hazard.

- Do not install or place unit on, over, or near combustible surfaces.
- Do not install unit near flammables.
- Do not overload building wiring - be sure power supply system is properly sized, rated, and protected to handle this unit.



### FALLING EQUIPMENT can injure.

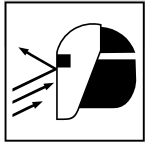
- Use lifting eye to lift unit and properly installed accessories only, NOT gas cylinders. Do not exceed maximum lift eye weight rating (see Specifications).
- Use correct procedures and equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.
- Keep equipment (cables and cords) away from moving vehicles when working from an aerial location.

- Follow the guidelines in the Applications Manual for the Revised NIOSH Lifting Equation (Publication No. 94-110) when manually lifting heavy parts or equipment.



### OVERHEATING can damage motors.

- Turn off or unplug equipment before starting or stopping engine.
- Do not let low voltage and frequency caused by low engine speed damage electric motors.
- Use only equipment suitable for operation on 60 or 50/60 Hz power.



### FLYING SPARKS can injure.

- Wear a face shield to protect eyes and face.
- Shape tungsten electrode only on grinder with proper guards in a safe location wearing proper face, hand, and body protection.
- Sparks can cause fires — keep flammables away.



### MOVING PARTS can injure.

- Keep away from moving parts.
- Keep away from pinch points such as drive rolls.



### BATTERY CHARGING OUTPUT and BATTERY EXPLOSION can injure.

Battery charging not present on all models.

- Always wear a face shield, rubber gloves, and protective clothing when working on a battery.
- Stop engine before disconnecting or connecting battery cables, battery charging cables (if applicable), or servicing battery.
- Do not allow tools to cause sparks when working on a battery.
- Do not use welder to charge batteries or jump start vehicles unless it has a battery charging feature designed for this purpose.
- Observe correct polarity (+ and -) on batteries.
- Disconnect negative (-) cable first and connect it last.
- Keep sparks, flames, cigarettes, and other ignition sources away from batteries. Batteries produce explosive gases during normal operation and when being charged.
- Follow battery manufacturer's instructions when working on or near a battery. See Battery Service Manual (listed in Safety Standards) for additional information.
- Have only qualified persons do battery charging work.
- If battery is being removed from a vehicle for charging, disconnect negative (-) cable first and connect it last. To prevent an arc, make sure all accessories are off.
- Charge lead-acid batteries only. Do not use battery charger to supply power to an extra-low-voltage electrical system or to charge dry cell batteries.
- Do not charge a frozen battery.
- Do not use damaged charging cables.
- Do not charge batteries in a closed area or where ventilation is restricted.
- Do not charge a battery that has loose terminals or one showing damage such as a cracked case or cover.
- Before charging battery, select correct charger voltage to match battery voltage.
- Set battery charging controls to the Off position before connecting to battery. Do not allow battery charging clips to touch each other.
- Keep charging cables away from vehicle hood, door, or moving parts.



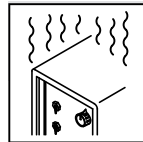
### HIGH PRESSURE FLUIDS can injure or kill.

- Engine fuel system components can be under high pressure.
- Before working on fuel system, turn off engine to release pressure.
- If any fluid is injected into the skin or body seek medical help immediately.



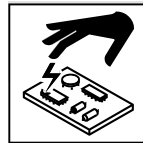
### WELDING WIRE can injure.

- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people, or any metal when threading welding wire.



### OVERUSE can cause OVERHEATING.

- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before starting to weld again.
- Do not block or filter airflow to unit.



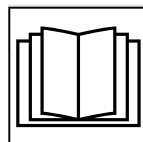
### STATIC (ESD) can damage PC boards.

- Put on grounded wrist strap BEFORE handling boards or parts.
- Use proper static-proof bags and boxes to store, move, or ship PC boards.



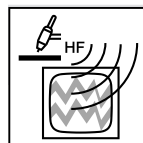
### TILTING OF TRAILER can injure.

- Use tongue jack or blocks to support weight.
- Properly install welding generator onto trailer according to instructions supplied with trailer.



### READ INSTRUCTIONS.

- Read and follow all labels and the Owner's Manual carefully before installing, operating, or servicing unit. Read the safety information at the beginning of the manual and in each section.
- Use only genuine replacement parts from the manufacturer.
- Perform installation, maintenance, and service according to the Owner's Manuals, industry standards, and national, state, and local codes.



### H.F. RADIATION can cause interference.

- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.



### ARC WELDING can cause interference.

- Electromagnetic energy can interfere with sensitive electronic equipment such as microprocessors, computers, and computer-driven equipment such as robots.
- Be sure all equipment in the welding area is electromagnetically compatible.

- To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor.
- Locate welding operation 100 meters from any sensitive electronic equipment.
- Be sure this welding machine is installed and grounded according to this manual.
- If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.

## 1-6. California Proposition 65 Warnings

**⚠ WARNING – This product can expose you to chemicals including lead, which are known to the state of California to cause cancer and birth defects or other reproductive harm.**

For more information, go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**For Diesel Engines:**

**⚠ WARNING – Breathing diesel engine exhaust exposes you to chemicals known to the state of California to cause cancer and birth defects or other reproductive harm.**

- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information, go to [www.P65Warnings.ca.gov/diesel](http://www.P65Warnings.ca.gov/diesel).

## 1-7. Principal Safety Standards

*Safety in Welding, Cutting, and Allied Processes*, American Welding Society standard ANSI Standard Z49.1. Website: <http://www.aws.org>.

*Safe Practices for the Preparation of Containers and Piping for Welding and Cutting*, American Welding Society Standard AWS F4.1 from Global Engineering Documents. Website: [www.global.ihs.com](http://www.global.ihs.com).

*Safe Practices for Welding and Cutting Containers that have Held Combustibles*, American Welding Society Standard AWS A6.0 from Global Engineering Documents. Website: [www.global.ihs.com](http://www.global.ihs.com).

*National Electrical Code*, NFPA Standard 70 from National Fire Protection Association. Website: [www.nfpa.org](http://www.nfpa.org) and [www.sparky.org](http://www.sparky.org).

*Safe Handling of Compressed Gases in Cylinders*, CGA Pamphlet P-1 from Compressed Gas Association. Website: [www.cganet.com](http://www.cganet.com).

*Safety in Welding, Cutting, and Allied Processes*, CSA Standard W117.2 from Canadian Standards Association. Website: [www.csagroup.org](http://www.csagroup.org).

*Battery Chargers*, CSA Standard C22.2 NO 107.2-01 from Canadian Standards Association. Website: [www.csagroup.org](http://www.csagroup.org).

*Safe Practice For Occupational And Educational Eye And Face Protection*, ANSI Standard Z87.1, from American National Standards Institute. Website: [www.ansi.org](http://www.ansi.org).

*Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, NFPA Standard 51B from National Fire Protection Association. Website: [www.nfpa.org](http://www.nfpa.org).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910.177 Subpart N, Part 1910 Subpart Q, and Part 1926, Subpart J. Website: [www.osha.gov](http://www.osha.gov).

*OSHA Important Note Regarding the ACGIH TLV, Policy Statement on the Uses of TLVs and BEIs*. Website: [www.osha.gov](http://www.osha.gov).

*Portable Generator Hazards Safety Alert* from U.S. Consumer Product Safety Commission (CPSC). Website: [www.cpsc.gov](http://www.cpsc.gov).

*Applications Manual for the Revised NIOSH Lifting Equation* from the National Institute for Occupational Safety and Health (NIOSH). Website: [www.cdc.gov/NIOSH](http://www.cdc.gov/NIOSH).

For Standards regulating hydraulic systems, contact the National Fluid Power Association. Website: [www.nfpa.com](http://www.nfpa.com).

*Battery Service Manual* from the Battery Council International. Website: [www.batterycouncil.org](http://www.batterycouncil.org).

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## 1-8. EMF Information

Electric current flowing through any conductor causes localized electric and magnetic fields (EMF). The current from arc welding (and allied processes including spot welding, gouging, plasma arc cutting, and induction heating operations) creates an EMF field around the welding circuit. EMF fields can interfere with some medical implants, e.g. pacemakers. Protective measures for persons wearing medical implants have to be taken. For example, restrict access for passers-by or conduct individual risk assessment for welders. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

1. Keep cables close together by twisting or taping them, or using a cable cover.
2. Do not place your body between welding cables. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around your body.

4. Keep head and trunk as far away from the equipment in the welding circuit as possible.
5. Connect work clamp to workpiece as close to the weld as possible.
6. Do not work next to, sit or lean on the welding power source.
7. Do not weld whilst carrying the welding power source or wire feeder.

### About Implanted Medical Devices:

Implanted Medical Device wearers should consult their doctor and the device manufacturer before performing or going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations. If cleared by your doctor, then following the above procedures is recommended.

# SECTION 2 – CONSIGNES DE SÉCURITÉ - LIRE AVANT UTILISATION


**⚠** Pour écarter les risques de blessure pour vous-même et pour autrui — lire, appliquer et ranger en lieu sûr ces consignes relatives aux précautions de sécurité et au mode opératoire.

## 2-1. Symboles utilisés

**⚠** **DANGER!** – Indique une situation dangereuse qui si on l'évite pas peut donner la mort ou des blessures graves. Les dangers possibles sont montrés par les symboles joints ou sont expliqués dans le texte.

**⚠** Indique une situation dangereuse qui si on l'évite pas peut donner la mort ou des blessures graves. Les dangers possibles sont montrés par les symboles joints ou sont expliqués dans le texte.

**AVIS** – Indique des déclarations pas en relation avec des blessures personnelles.

 Indique des instructions spécifiques.



Ce groupe de symboles veut dire Avertissement! Attention! DANGER DE CHOC ELECTRIQUE, PIECES EN MOUVEMENT, et PIECES CHAUDES. Reportez-vous aux symboles et aux directives ci-dessous afin de connaître les mesures à prendre pour éviter tout danger.

## 2-2. Dangers relatifs au soudage à l'arc

**⚠** Les symboles présentés ci-après sont utilisés tout au long du présent manuel pour attirer votre attention et identifier les risques de danger. Lorsque vous voyez un symbole, soyez vigilant et suivez les directives mentionnées afin d'éviter tout danger. Les consignes de sécurité présentées ci-après ne font que résumer les informations contenues dans les principales normes de sécurité énumérées à la section 2-7. Veuillez lire et respecter toutes ces normes de sécurité.

**⚠** L'installation, l'utilisation, l'entretien et les réparations ne doivent être confiés qu'à des personnes qualifiées. Une personne qualifiée est définie comme celle qui, par la possession d'un diplôme reconnu, d'un certificat ou d'un statut professionnel, ou qui, par une connaissance, une formation et une expérience approfondies, a démontré avec succès sa capacité à résoudre les problèmes liés à la tâche, le travail ou le projet et a reçu une formation en sécurité afin de reconnaître et d'éviter les risques inhérents.

**⚠** Au cours de l'utilisation, tenir toute personne à l'écart et plus particulièrement les enfants.



### UN CHOC ÉLECTRIQUE peut tuer.

Un simple contact avec des pièces électriques peut provoquer une électrocution ou des blessures graves. L'électrode et le circuit de soudage sont sous tension dès que l'appareil est sur ON. Le circuit d'entrée et les circuits internes de l'appareil sont également sous tension à ce moment-là. En soudage semi-automatique ou automatique, le fil, le dévidoir, le logement des galets d'entraînement et les pièces métalliques en contact avec le fil de soudage sont sous tension. Des matériels mal installés ou mal mis à la terre présentent un danger.

- Ne jamais toucher les pièces électriques sous tension.
- Porter des gants et des vêtements de protection secs ne comportant pas de trous.
- S'isoler de la pièce et de la terre au moyen de tapis ou d'autres moyens isolants suffisamment grands pour empêcher le contact physique éventuel avec la pièce ou la terre.
- Ne pas utiliser de sortie de soudage CA dans des zones humides ou confinées ou s'il y a un risque de chute.
- Se servir d'une source électrique à courant électrique UNIQUEMENT si le procédé de soudage le demande.
- Si l'utilisation d'une source électrique à courant électrique s'avère nécessaire, se servir de la fonction de télécommande si l'appareil en est équipé.
- Des précautions de sécurité supplémentaires sont requises dans des environnements à risque comme: les endroits humides ou lorsque l'on porte des vêtements mouillés; sur des structures

métalliques au sol, grillages et échafaudages; dans des positions assises, à genoux et allongées; ou quand il y a un risque important de contact accidentel avec la pièce ou le sol. Dans ces cas utiliser les appareils suivants dans l'ordre de préférence: 1) un poste à souder DC semi-automatique de type CV (MIG/MAG), 2) un poste à souder manuel (électrode enrobée) DC, 3) un poste à souder manuel AC avec tension à vide réduite. Dans la plupart des cas, un poste courant continu de type CV est recommandé. Et, ne pas travailler seul!

- Ne brancher aucun système de distribution électrique normalement fourni par un réseau public à moins qu'un commutateur de transfert et une procédure de mise à la terre adéquats ne soient mis en place.
- Couper l'alimentation ou arrêter le moteur avant de procéder à l'installation, à la réparation ou à l'entretien de l'appareil. Déverrouiller l'alimentation selon la norme OSHA 29 CFR 1910.147 (voir normes de sécurité).
- Installer et mettre à la terre correctement cet appareil conformément à son manuel d'utilisation et aux codes nationaux, provinciaux et municipaux.
- Toujours vérifier la terre du cordon d'alimentation - Vérifier et s'assurer que le fil de terre du cordon d'alimentation est bien raccordé à la borne de terre du sectionneur ou que la fiche du cordon est raccordée à une prise correctement mise à la terre.
- En effectuant les raccordements d'entrée fixer d'abord le conducteur de mise à la terre approprié et contre-vérifier les connexions.
- Les câbles doivent être exempts d'humidité, d'huile et de graisse; protégez-les contre les étincelles et les pièces métalliques chaudes.
- Vérifier fréquemment le cordon d'alimentation et le conducteur de mise à la terre afin de s'assurer qu'il n'est pas altéré ou dénudé -, le remplacer immédiatement s'il l'est -. Un fil dénudé peut entraîner la mort.
- Mettre l'appareil hors tension quand on ne l'utilise pas.
- Ne pas utiliser des câbles usés, endommagés, sous dimensionnés ou réparés.
- Ne pas enrouler les câbles autour du corps.
- Si la pièce soudée doit être mise à la terre, la faire directement avec un câble distinct - ne pas utiliser le connecteur de pièce ou le câble de retour.
- Ne pas toucher l'électrode quand on est en contact avec la pièce, la terre ou une électrode provenant d'une autre machine.
- Ne pas toucher des porte électrodes connectés à deux machines en même temps à cause de la présence d'une tension à vide doublée.

- N'utiliser qu'un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretenir l'appareil conformément à ce manuel.
- Ne pas toucher aux portes-électrodes qui sont raccordés à deux machines à souder en même temps, car cela entraîne la présence d'une tension de circuit-ouvert double.
- Porter un harnais de sécurité quand on travaille en hauteur.
- Maintenir solidement en place tous les panneaux et capots.
- Fixer le câble de retour de façon à obtenir un bon contact métal-métal avec la pièce à souder ou la table de travail, le plus près possible de la soudure.
- Isoler la pince de masse quand pas mis à la pièce pour éviter le contact avec tout objet métallique.
- Ne pas raccorder plus d'une électrode ou plus d'un câble de masse à une même borne de sortie de soudage. Débrancher le câble pour le procédé non utilisé.
- Utiliser une protection GFCI lors de l'utilisation d'appareils auxiliaires. Testez les prises GFCI à haute vitesse.

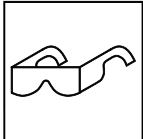
**Il reste une TENSION DC NON NÉGLIGEABLE dans les sources de soudage onduleur UNE FOIS le moteur coupé.**

- Arrêtez le moteur sur l'onduleur et déchargez les condensateurs d'entrée conformément aux instructions du manuel avant de toucher les pièces.



**LES PIÈCES CHAUDES peuvent provoquer des brûlures.**

- Ne pas toucher à mains nues les parties chaudes.
- Prévoir une période de refroidissement avant de travailler à l'équipement.
- Ne pas toucher aux pièces chaudes, utiliser les outils recommandés et porter des gants de soudage et des vêtements épais pour éviter les brûlures.



**DES PIÈCES DE METAL ou DES SALETES peuvent provoquer des blessures dans les yeux.**

- Le soudage, l'écaillage, le passage de la pièce à la brosse en fil de fer, et le meulage génèrent des étincelles et des particules métalliques volantes. Pendant la période de refroidissement des soudures, elles risquent de projeter du laitier.
- Porter des lunettes de sécurité avec écrans latéraux ou un écran facial.



**LES FUMÉES ET LES GAZ peuvent être dangereux.**

Le soudage génère des fumées et des gaz. Leur inhalation peut être dangereux pour votre santé.

- Eloigner votre tête des fumées. Ne pas respirer les fumées.
- À l'intérieur, ventiler la zone et/ou utiliser une ventilation forcée au niveau de l'arc pour l'évacuation des fumées et des gaz de soudage. Pour déterminer la bonne ventilation, il est recommandé de procéder à un prélèvement pour la composition et la quantité de fumées et de gaz auxquelles est exposé le personnel.
- Si la ventilation est médiocre, porter un respirateur anti-vapeurs approuvé.
- Lire et comprendre les fiches de données de sécurité et les instructions du fabricant concernant les adhésifs, les revêtements, les nettoyants, les consommables, les produits de refroidissement, les dégraissants, les flux et les métaux.
- Travailler dans un espace fermé seulement s'il est bien ventilé ou en portant un respirateur à alimentation d'air. Demander toujours à un surveillant dûment formé de se tenir à proximité. Des fumées et des gaz de soudage peuvent déplacer l'air et abaisser le niveau d'oxygène provoquant des blessures ou des accidents mortels. S'assurer que l'air de respiration ne présente aucun danger.

- Ne pas souder dans des endroits situés à proximité d'opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur et les rayons de l'arc peuvent réagir en présence de vapeurs et former des gaz hautement toxiques et irritants.
- Ne pas souder des métaux munis d'un revêtement, tels que l'acier galvanisé, plaqué en plomb ou au cadmium à moins que le revêtement n'ait été enlevé dans la zone de soudure, que l'endroit soit bien ventilé, et en portant un respirateur à alimentation d'air. Les revêtements et tous les métaux renfermant ces éléments peuvent dégager des fumées toxiques en cas de soudage.



**LES ACCUMULATIONS DE GAZ risquent de provoquer des blessures ou même la mort.**

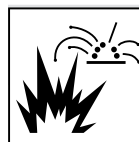
- Fermer l'alimentation du gaz comprimé en cas de non utilisation.
- Veiller toujours à bien aérer les espaces confinés ou se servir d'un respirateur d'adduction d'air homologué.



**LES RAYONS DE L'ARC peuvent provoquer des brûlures dans les yeux et sur la peau.**

Le rayonnement de l'arc du procédé de soudage génère des rayons visibles et invisibles intenses (ultraviolets et infrarouges) susceptibles de provoquer des brûlures dans les yeux et sur la peau. Des étincelles sont projetées pendant le soudage.

- Porter un casque de soudage approuvé muni de verres filtrants approprié pour protéger visage et yeux pour protéger votre visage et vos yeux pendant le soudage ou pour regarder (voir ANSI Z49.1 et Z87.1 énuméré dans les normes de sécurité).
- Porter des lunettes de sécurité avec écrans latéraux même sous votre casque.
- Avoir recours à des écrans protecteurs ou à des rideaux pour protéger les autres contre les rayonnements les éblouissements et les étincelles ; prévenir toute personne sur les lieux de ne pas regarder l'arc.
- Porter un équipement de protection pour le corps fait d'un matériau résistant et ignifuge (cuir, coton robuste, laine). La protection du corps comporte des vêtements sans huile comme par ex. des gants de cuir, une chemise solide, des pantalons sans revers, des chaussures hautes et une casquette.

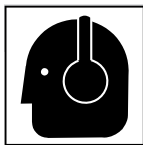


**LE SOUDAGE peut provoquer un incendie ou une explosion.**

Le soudage effectué sur des conteneurs fermés tels que des réservoirs, tambours ou des conduites peut provoquer leur éclatement. Des étincelles peuvent être projetées de l'arc de soudure. La projection d'étincelles, des pièces chaudes et des équipements chauds peut provoquer des incendies et des brûlures. Le contact accidentel de l'électrode avec des objets métalliques peut provoquer des étincelles, une explosion, un surchauffement ou un incendie. Avant de commencer le soudage, vérifier et s'assurer que l'endroit ne présente pas de danger.

- Déplacer toutes les substances inflammables à une distance de 10,7 m de l'arc de soudage. En cas d'impossibilité les recouvrir soigneusement avec des protections homologués.
- Ne pas souder dans un endroit où des étincelles peuvent tomber sur des substances inflammables.
- Se protéger et d'autres personnes de la projection d'étincelles et de métal chaud.
- Des étincelles et des matériaux chauds du soudage peuvent facilement passer dans d'autres zones en traversant de petites fissures et des ouvertures.
- Surveiller tout déclenchement d'incendie et tenir un extincteur à proximité.

- Le soudage effectué sur un plafond, plancher, paroi ou séparation peut déclencher un incendie de l'autre côté.
- Ne pas couper ou souder des jantes ou des roues. Les pneus peuvent exploser s'ils sont chauffés. Les jantes et les roues réparées peuvent défaillir. Voir OSHA 29 CFR 1910.177 énuméré dans les normes de sécurité.
- Ne pas effectuer le soudage sur des conteneurs fermés tels que des réservoirs, tambours, ou conduites, à moins qu'ils n'aient été préparés correctement conformément à AWS F4.1 et AWS A6.0 (voir les Normes de Sécurité).
- Ne pas souder là où l'air ambiant pourrait contenir des poussières, gaz ou émanations inflammables (vapeur d'essence, par exemple).
- Brancher le câble de masse sur la pièce la plus près possible de la zone de soudage pour éviter le transport du courant sur une longue distance par des chemins inconnus éventuels en provoquant des risques d'électrocution, d'étincelles et d'incendie.
- Ne pas utiliser le poste de soudage pour dégeler des conduites gelées.
- En cas de non utilisation, enlever la baguette d'électrode du porte-électrode ou couper le fil à la pointe de contact.
- Porter un équipement de protection pour le corps fait d'un matériau résistant et ignifuge (cuir, coton robuste, laine). La protection du corps comporte des vêtements sans huile comme par ex. des gants de cuir, une chemise solide, des pantalons sans revers, des chaussures hautes et une casquette.
- Avant de souder, retirer toute substance combustible de vos poches telles qu'un allumeur au butane ou des allumettes.
- Une fois le travail achevé, assurez-vous qu'il ne reste aucune trace d'étincelles incandescentes ni de flammes.
- Utiliser exclusivement des fusibles ou coupe-circuits appropriés. Ne pas augmenter leur puissance; ne pas les ponter.
- Suivre les recommandations dans OSHA 1910.252 (a) (2) (iv) et NFPA 51B pour les travaux à chaud et avoir de la surveillance et un extincteur à proximité.
- Lire et comprendre les fiches de données de sécurité et les instructions du fabricant concernant les adhésifs, les revêtements, les nettoyants, les consommables, les produits de refroidissement, les dégraisseurs, les flux et les métaux.

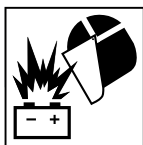


### LE BRUIT peut affecter l'ouïe.

Le bruit des processus et des équipements peut affecter l'ouïe.

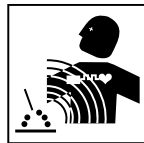
- Porter des protections approuvés pour les oreilles si le niveau sonore est trop élevé.

## 2-3. Dangers existant en relation avec le moteur



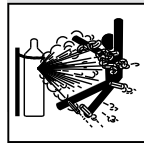
### L'EXPLOSION DE LA BATTERIE peut provoquer des blessures.

- Toujours porter une protection faciale, des gants en caoutchouc et vêtements de protection lors d'une intervention sur la batterie.
- Arrêter le moteur avant de débrancher ou de brancher des câbles de batterie, des câbles de chargeur de batterie (le cas échéant) ou de batterie d'entretien.
- Éviter de provoquer des étincelles avec les outils en travaillant sur la batterie.
- Ne pas utiliser l'appareil de soudage pour charger des batteries ou faire démarrer des véhicules à l'aide de câbles de démarrage, sauf si l'appareil dispose d'une fonctionnalité de charge de batterie destinée à cet usage.
- Observer la polarité correcte (+ et -) sur les batteries.



### Les CHAMPS ÉLECTROMAGNÉTIQUES (CEM) peuvent affecter les implants médicaux.

- Les porteurs de stimulateurs cardiaques et autres implants médicaux doivent rester à distance.
- Les porteurs d'implants médicaux doivent consulter leur médecin et le fabricant du dispositif avant de s'approcher de la zone où se déroule du soudage à l'arc, du soudage par points, du gougeage, de la découpe plasma ou une opération de chauffage par induction.



### Si des BOUTEILLES sont endommagées, elles pourront exploser.

Des bouteilles de gaz comprimé protecteur contiennent du gaz sous haute pression. Si une bouteille est endommagée, elle peut exploser. Du fait que les bouteilles de gaz font normalement partie du procédé de soudage, les manipuler avec précaution.

- Protéger les bouteilles de gaz comprimé d'une chaleur excessive, des chocs mécaniques, des dommages physiques, du laitier, des flammes ouvertes, des étincelles et des arcs.
- Placer les bouteilles debout en les fixant dans un support stationnaire ou dans un porte-bouteilles pour les empêcher de tomber ou de se renverser.
- Tenir les bouteilles éloignées des circuits de soudage ou autres circuits électriques.
- Ne jamais placer une torche de soudage sur une bouteille à gaz.
- Une électrode de soudage ne doit jamais entrer en contact avec une bouteille.
- Ne jamais souder une bouteille pressurisée - risque d'explosion.
- Utiliser seulement des bouteilles de gaz comprimé, régulateurs, tuyaux et raccords convenables pour cette application spécifique; les maintenir ainsi que les éléments associés en bon état.
- Tourner le dos à la sortie de vanne lors de l'ouverture de la vanne de la bouteille. Ne pas se tenir devant ou derrière le régulateur lors de l'ouverture de la vanne.
- Maintenir le chapeau de protection sur la soupape, sauf en cas d'utilisation ou de branchement de la bouteille.
- Utilisez les équipements corrects, les bonnes procédures et suffisamment de personnes pour soulever, déplacer et transporter les bouteilles.
- Lire et suivre les instructions sur les bouteilles de gaz comprimé, l'équipement connexe et le dépliant P-1 de la CGA (Compressed Gas Association) mentionné dans les principales normes de sécurité.



### LE CARBURANT MOTEUR peut provoquer un incendie ou une explosion.

- Arrêter le moteur avant de vérifier le niveau de carburant ou de faire le plein.

- Ne pas faire le plein en fumant ou proche d'une source d'étincelles ou d'une flamme nue.
- Ne pas faire le plein de carburant à ras bord; prévoir de l'espace pour son expansion.
- Faire attention de ne pas renverser de carburant. Nettoyer tout carburant renversé avant de faire démarrer le moteur.
- Jeter les chiffons dans un récipient ignifuge.
- Toujours garder le pistolet en contact avec le réservoir lors du remplissage.



### Les PIÈCES MOBILES peuvent causer des blessures.

- S'abstenir de toucher des parties mobiles telles que des ventilateurs, courroies et rotors.
- Maintenir fermés et verrouillés les portes, panneaux, recouvrements et dispositifs de protection.
- Arrêter le moteur avant d'installer ou brancher l'appareil.
- Lorsque cela est nécessaire pour des travaux d'entretien et de dépannage, faire retirer les portes, panneaux, recouvrements ou dispositifs de protection uniquement par du personnel qualifié.
- Pour empêcher tout démarrage accidentel pendant les travaux d'entretien, débrancher le câble négatif (-) de batterie de la borne.
- Ne pas approcher les mains, cheveux, vêtements lâches et outils des organes mobiles.
- Remettre en place les portes, panneaux, recouvrements ou dispositifs de protection à la fin des travaux d'entretien et avant de mettre le moteur en marche.
- Avant d'intervenir, déposer les bougies ou injecteurs pour éviter la mise en route accidentelle du moteur.
- Bloquer le volant moteur pour éviter sa rotation lors d'une intervention sur le générateur.



### LES ÉTINCELLES À L'ÉCHAPPEMENT peuvent provoquer un incendie.

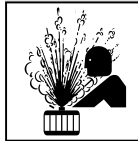
- Empêcher les étincelles d'échappement du moteur de provoquer un incendie.
- Utiliser uniquement un pare-étincelles approuvé - voir codes en vigueur.



### LES PIÈCES CHAUDES peuvent provoquer des brûlures.

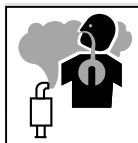
- Ne pas toucher des parties chaudes à mains nues.
- Prévoir une période de refroidissement avant de travailler à l'équipement.

- Ne pas toucher aux pièces chaudes, utiliser les outils recommandés et porter des gants de soudage et des vêtements épais pour éviter les brûlures.



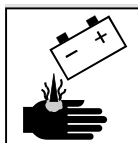
### LA VAPEUR ET LE LIQUIDE DE REFROIDISSEMENT CHAUD peuvent provoquer des brûlures.

- Il est préférable de vérifier le liquide de refroidissement une fois le moteur refroidi pour éviter de se brûler.
- Toujours vérifier le niveau de liquide de refroidissement dans le vase d'expansion (si présent), et non dans le radiateur (sauf si précisé autrement dans la section maintenance du manuel du moteur).
- Si le moteur est chaud et que le liquide doit être vérifié, opérer comme suivant.
- Mettre des lunettes de sécurité et des gants, placer un torchon sur le bouchon du radiateur.
- Dévisser le bouchon légèrement et laisser la vapeur s'échapper avant d'enlever le bouchon.



### L'utilisation d'un groupe autonome à l'intérieur PEUT VOUS TUER EN QUELQUES MINUTES.

- Les fumées d'un groupe autonome contient du monoxyde de carbone. C'est un poison invisible et inodore.
- JAMAIS utiliser dans une maison ou garage, même avec les portes et fenêtres ouvertes.
- Uniquement utiliser à l'EXTERIEUR, loin des portes, fenêtres et bouches aération.



### L'ACIDE DE LA BATTERIE peut provoquer des brûlures dans les YEUX et sur la PEAU.

- Ne pas renverser la batterie.
- Remplacer une batterie endommagée.
- Rincer immédiatement les yeux et la peau à l'eau.



### LA CHALEUR DU MOTEUR peut provoquer un incendie.

- Ne pas placer l'appareil sur, au-dessus ou à proximité de surfaces inflammables.
- Tenir à distance les produits inflammables de l'échappement.

## 2-4. Dangers liés à l'air comprimé



### Un ÉQUIPEMENT PNEUMATIQUE risque de provoquer des blessures ou même la mort.

- Une installation ou une utilisation incorrecte de cet appareil pourrait conduire à des dégâts matériels ou corporels. Seul un personnel qualifié est autorisé à installer, utiliser et entretenir cet appareil conformément à son manuel d'utilisation, aux normes industrielles et aux codes nationaux, d'état ou locaux.
- Ne pas dépasser le débit nominal ou la capacité du compresseur ou de tout équipement du circuit d'air comprimé. Concevoir le circuit d'air comprimé de telle sorte que la défaillance d'un composant ne risque pas de provoquer un accident matériel ou corporel.
- Avant d'intervenir sur le circuit d'air comprimé, couper l'alimentation électrique, verrouiller et étiqueter l'appareil, détendre la pression et s'assurer que le circuit d'air ne peut être mis sous pression par inadvertance.

- Ne pas intervenir sur le circuit d'air comprimé lorsque l'appareil fonctionne. Seul un personnel qualifié est autorisé, et appliquant les consignes du fabricant.
- Ne pas modifier ou altérer le compresseur ou les équipements fournis par le fabricant. Ne pas débrancher, désactiver ou neutraliser les équipements de sécurité du circuit d'air comprimé.
- Utiliser uniquement des composants et accessoires homologués par le fabricant.
- Se tenir à l'écart de tout point présentant un danger de pincement ou d'écrasement créé par l'équipement raccordé au circuit d'air comprimé.
- Ne pas intervenir sous ou autour d'un équipement qui n'est soutenu que par la pression pneumatique. Soutenir l'équipement de façon appropriée par un moyen mécanique.



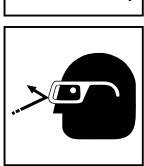


**MÉTAL CHAUD** provenant du découpage ou du gougeage à l'arc risque de provoquer un incendie ou une explosion.

- Ne pas découper ou gouger à proximité de produits inflammables.
- Attention aux risques d'incendie: tenir un extincteur à proximité.



**L'AIR COMPRIMÉ** risque de provoquer des blessures ou même la mort.



- Avant d'intervenir sur le circuit d'air comprimé, couper l'alimentation électrique, verrouiller et étiqueter l'appareil, détendre la pression et s'assurer que le circuit d'air ne peut être mis sous pression par inadvertance.
- Détendre la pression avant de débrancher ou de brancher des canalisations d'air.
- Avant d'utiliser l'appareil, contrôler les composants du circuit d'air comprimé, les branchements et les flexibles en recherchant tout signe de détérioration, de fuite et d'usure.
- Ne pas diriger un jet d'air vers soi-même ou vers autrui.
- Pour intervenir sur un circuit d'air comprimé, porter un équipement de protection tel que des lunettes de sécurité, des gants de cuir, une chemise et un pantalon en tissu résistant, des chaussures montantes et une coiffe.
- Pour rechercher des fuites, utiliser de l'eau savonneuse ou un détecteur à ultrasons, jamais les mains nues. En cas de détection de fuite, ne pas utiliser l'équipement.
- Remettre les portes, panneaux, recouvrements ou dispositifs de protection quand l'entretien est terminé et avant de mettre en marche l'appareil.
- En cas d'injection d'air dans la peau ou le corps, demander immédiatement une assistance médicale.



**L'INHALATION D'AIR COMPRIMÉ** risque de provoquer des blessures ou même la mort.

- Ne pas inhaler d'air comprimé.
- Utiliser l'air comprimé uniquement pour découper ou gouger ainsi que pour l'outillage pneumatique.



Une **PRESSION D'AIR RÉSIDUELLE** ET DES FLEXIBLES QUI FOUETTENT risquent de provoquer des blessures.

- Détendre la pression pneumatique des outils et circuits avant d'entretenir, ajouter ou changer des accessoires et avant d'ouvrir le bouchon de vidange ou de remplissage d'huile du compresseur.



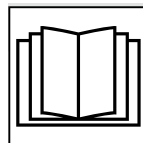
Les **PIÈCES MOBILES** peuvent causer des blessures.

- S'abstenir de toucher des parties mobiles telles que des ventilateurs, courroies et rotors.
- Maintenir fermés et verrouillés les portes, panneaux, recouvrements et dispositifs de protection.
- Ne pas approcher les mains, cheveux, vêtements lâches et outils des organes mobiles.
- Avant d'intervenir sur le circuit d'air comprimé, couper l'alimentation électrique, verrouiller et étiqueter l'appareil, détendre la pression et s'assurer que le circuit d'air ne peut être mis sous pression par inadvertance.
- Demander seulement à un personnel qualifié d'enlever les dispositifs de sécurité ou les recouvrements pour effectuer, s'il y a lieu, des travaux d'entretien et de dépannage.
- Remettre en place les portes, panneaux, recouvrements ou dispositifs de protection à la fin des travaux d'entretien et avant de mettre le moteur en marche.



**DES PIÈCES CHAUDES** peuvent provoquer des brûlures graves.

- Ne pas toucher de pièces chaudes du compresseur ou du circuit d'air.
- Prévoir une période de refroidissement avant d'intervenir sur l'équipement.
- Ne pas toucher aux pièces chaudes, utiliser les outils recommandés et porter des gants de soudage et des vêtements épais pour éviter les brûlures.



**LIRE LES INSTRUCTIONS.**

- Lire et appliquer les instructions sur les étiquettes et le Mode d'emploi avant l'installation, l'utilisation ou l'entretien de l'appareil. Lire les informations de sécurité au début du manuel et dans chaque section.
- N'utiliser que les pièces de rechange recommandées par le constructeur.
- Effectuer l'installation, l'entretien et toute intervention selon les manuels d'utilisateurs, les normes nationales, provinciales et de l'industrie, ainsi que les codes municipaux.

## 2-5. Symboles de dangers supplémentaires en relation avec l'installation, le fonctionnement et la maintenance



**Risque D'INCENDIE OU D'EXPLOSION.**

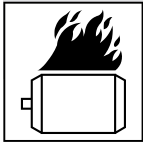
- Ne pas placer l'appareil sur, au-dessus ou à proximité de surfaces inflammables.
- Ne pas installer l'appareil à proximité de produits inflammables.
- Ne pas surcharger l'installation électrique - s'assurer que l'alimentation est correctement dimensionnée et protégée avant de mettre l'appareil en service.



**LA CHUTE DE L'ÉQUIPEMENT** peut provoquer des blessures.

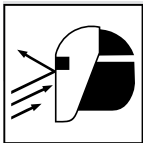
- Utiliser l'anneau de levage pour lever l'appareil et les accessoires correctement installés seuls, PAS les bouteilles de gaz. Ne pas dépasser le poids nominal maximal de l'œilleton (voir les spécifications).
- Utilisez les procédures correctes et des équipements d'une capacité appropriée pour soulever et supporter l'appareil.
- En utilisant des fourches de levage pour déplacer l'unité, s'assurer que les fourches sont suffisamment longues pour dépasser du côté opposé de l'appareil.
- Tenir l'équipement (câbles et cordons) à distance des véhicules mobiles lors de toute opération en hauteur.

- Suivre les consignes du Manuel des applications pour l'équation de levage NIOSH révisée (Publication N°94-110) lors du levage manuel de pièces ou équipements lourds.



### LE SURCHAUFFEMENT peut endommager le moteur électrique.

- Arrêter ou déconnecter l'équipement avant de démarrer ou d'arrêter le moteur.
- Ne pas laisser tourner le moteur trop lentement sous risque d'endommager le moteur électrique à cause d'une tension et d'une fréquence trop faibles.
- Utiliser uniquement des équipements adéquats pour un fonctionnement avec une alimentation de 50/60 ou de 60 Hz.



### LES ÉTINCELLES PROJÉTÉES peuvent provoquer des blessures.

- Porter un écran facial pour protéger le visage et les yeux.
- Affûter l'électrode au tungstène uniquement à la meuleuse dotée de protecteurs. Cette manœuvre est à exécuter dans un endroit sûr lorsque l'on porte l'équipement homologué de protection du visage, des mains et du corps.
- Les étincelles risquent de causer un incendie - éloigner toute substance inflammable.



### Les PIÈCES MOBILES peuvent causer des blessures.

- Ne pas s'approcher des organes mobiles.
- Ne pas s'approcher des points de coincement tels que des rouleaux de commande.



### LA SORTIE DE RECHARGE et L'EXPLOSION DE LA BATTERIE peuvent provoquer des blessures.

La recharge de batterie n'existe pas sur tous les modèles.

- Toujours porter une protection faciale, des gants en caoutchouc et vêtements de protection lors d'une intervention sur la batterie.
- Arrêter le moteur avant de débrancher ou de brancher des câbles de batterie, des câbles de chargeur de batterie (le cas échéant) ou de batterie d'entretien.
- Éviter de provoquer des étincelles avec les outils en travaillant sur la batterie.
- Ne pas utiliser l'appareil de soudage pour charger des batteries ou faire démarrer des véhicules à l'aide de câbles de démarrage, sauf si l'appareil dispose d'une fonctionnalité de charge de batterie destinée à cet usage.
- Observer la polarité correcte (+ et -) sur les batteries.
- Débrancher le câble négatif (-) en premier lieu. Le rebrancher en dernier lieu.
- Les sources d'étincelles, flammes nues, cigarettes et autres sources d'inflammation doivent être maintenues à l'écart des batteries. Ces dernières produisent des gaz explosifs en fonctionnement normal et en cours de charge.
- Suivre les instructions du fabricant de la batterie lors d'opérations sur une batterie ou à proximité de celle-ci. Voir le manuel de service de batterie (indiqué dans Normes de sécurité) pour plus d'informations.
- Les opérations de charge de batterie ne doivent être effectuées que par des personnes qualifiées.
- Pour enlever la batterie d'un véhicule pour la recharge, débrancher tout d'abord le câble négatif (-) et le rebrancher en dernier lieu. Pour éviter un arc, s'assurer que tous les accessoires sont débranchés.

- Ne charger que des batteries plomb-acide. Ne pas utiliser le chargeur de batterie pour alimenter un autre circuit électrique basse tension ou pour charger des batteries sèches.
- Ne pas charger une batterie gelée.
- Ne pas utiliser de câbles de charge endommagés.
- Ne pas charger des batteries dans un espace fermé ou en l'absence d'une ventilation.
- Ne pas charger une batterie dont les bornes sont desserrées ou présentant une détérioration comme par exemple un boîtier ou un couvercle fissuré.
- Avant de charger une batterie, sélectionner la tension de charge correspondant à la tension de la batterie.
- Régler les commandes de charge de batterie sur la position d'arrêt avant de brancher la batterie. Veiller à ce que les pinces de charge ne se touchent pas.
- Ranger les câbles de charge à distance du capot, des portes et des pièces mobiles du véhicule.



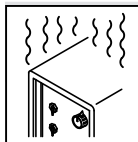
### LES LIQUIDES PRESSURISÉS peuvent blesser ou tuer.

- Les composants du système d'alimentation peuvent contenir du carburant sous pression élevée.
- Avant d'intervenir sur le système d'alimentation de carburant, arrêter le moteur pour dépressuriser le système.
- En cas d'injection de tout liquide sous la peau ou dans le corps, solliciter une aide médicale sur le champ.



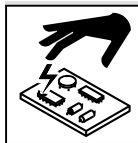
### LES FILS DE SOUDAGE peuvent provoquer des blessures.

- Ne pas appuyer sur la gâchette avant d'en avoir reçu l'instruction.
- Ne pas diriger le pistolet vers soi, d'autres personnes ou toute pièce mécanique en engageant le fil de soudage.



### L'EMPLOI EXCESSIF peut SURCHAUFFER L'ÉQUIPEMENT.

- Laisser l'équipement refroidir ; respecter le facteur de marche nominal.
- Réduire le courant ou le facteur de marche avant de poursuivre le soudage.
- Ne pas obstruer les passages d'air du poste.



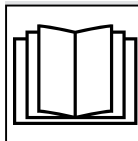
### LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.

- Établir la connexion avec la barrette de terre avant de manipuler des cartes ou des pièces.
- Utiliser des pochettes et des boîtes antistatiques pour stocker, déplacer ou expédier des cartes de circuits imprimés.



### UNE REMORQUE QUI BASCULE peut provoquer des blessures.

- Utiliser les supports de la remorque ou des blocs pour soutenir le poids.
- Installer convenablement le poste sur la remorque comme indiqué dans le manuel s'y rapportant.



### LIRE LES INSTRUCTIONS.

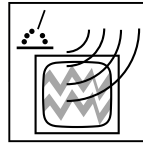
- Lire et appliquer les instructions sur les étiquettes et le Mode d'emploi avant l'installation, l'utilisation ou l'entretien de l'appareil. Lire les informations de sécurité au début du manuel et dans chaque section.
- N'utiliser que les pièces de rechange recommandées par le constructeur.

- Effectuer l'installation, l'entretien et toute intervention selon les manuels d'utilisateurs, les normes nationales, provinciales et de l'industrie, ainsi que les codes municipaux.



### LE RAYONNEMENT HAUTE FRÉQUENCE (H.F.) risque de provoquer des interférences.

- Le rayonnement haute fréquence (H.F.) peut provoquer des interférences avec les équipements de radio-navigation et de communication, les services de sécurité et les ordinateurs.
- Demander seulement à des personnes qualifiées familiarisées avec des équipements électroniques de faire fonctionner l'installation.
- L'utilisateur est tenu de faire corriger rapidement par un électricien qualifié les interférences résultant de l'installation.
- Si le FCC signale des interférences, arrêter immédiatement l'appareil.
- Effectuer régulièrement le contrôle et l'entretien de l'installation.
- Maintenir soigneusement fermés les portes et les panneaux des sources de haute fréquence, maintenir les éclateurs à une distance correcte et utiliser une terre et un blindage pour réduire les interférences éventuelles.



### LE SOUDAGE À L'ARC risque de provoquer des interférences.

- L'énergie électromagnétique risque de provoquer des interférences pour l'équipement électronique sensible tel que les ordinateurs et l'équipement commandé par ordinateur tel que les robots.

- Veiller à ce que tout l'équipement de la zone de soudage soit compatible électromagnétiquement.
- Pour réduire la possibilité d'interférence, maintenir les câbles de soudage aussi courts que possible, les grouper, et les poser aussi bas que possible (ex. par terre).
- Veiller à souder à une distance de 100 mètres de tout équipement électronique sensible.
- Veiller à ce que ce poste de soudage soit posé et mis à la terre conformément à ce mode d'emploi.
- En cas d'interférences après avoir pris les mesures précédentes, il incombe à l'utilisateur de prendre des mesures supplémentaires telles que le déplacement du poste, l'utilisation de câbles blindés, l'utilisation de filtres de ligne ou la pose de protecteurs dans la zone de travail.

## 2-6. Proposition californienne 65 Avertissements

**⚠ AVERTISSEMENT – ce produit peut vous exposer à des produits chimiques tels que le plomb, reconnus par l'État de Californie comme cancérigènes et sources de malformations ou d'autres troubles de la reproduction.**

Pour plus d'informations, consulter [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Pour les moteurs diesel :**

**⚠ AVERTISSEMENT – les gaz d'échappement de moteurs diesel vous exposent à des produits chimiques, reconnus par l'État de Californie comme cancérigènes et sources de malformations ou d'autres troubles de la reproduction.**

- Toujours démarrer et faire tourner le moteur dans une zone bien aérée.
- Si la zone est fermée, diriger l'échappement vers l'extérieur.
- Ne pas modifier ni altérer le système d'échappement.
- Ne pas faire tourner le moteur au ralenti, sauf si nécessaire.

Pour plus d'informations, consulter [www.P65Warnings.ca.gov/diesel](http://www.P65Warnings.ca.gov/diesel).

## 2-7. Principales normes de sécurité

*Safety in Welding, Cutting, and Allied Processes*, American Welding Society standard ANSI Standard Z49.1. Website: <http://www.aws.org>.

*Safe Practices for the Preparation of Containers and Piping for Welding and Cutting*, American Welding Society Standard AWS F4.1 from Global Engineering Documents. Website: [www.global.ihs.com](http://www.global.ihs.com).

*Safe Practices for Welding and Cutting Containers that have Held Combustibles*, American Welding Society Standard AWS A6.0 from Global Engineering Documents. Website: [www.global.ihs.com](http://www.global.ihs.com).

*National Electrical Code*, NFPA Standard 70 from National Fire Protection Association. Website: [www.nfpa.org](http://www.nfpa.org) and [www.sparky.org](http://www.sparky.org).

*Safe Handling of Compressed Gases in Cylinders*, CGA Pamphlet P-1 from Compressed Gas Association. Website: [www.cganet.com](http://www.cganet.com).

*Safety in Welding, Cutting, and Allied Processes*, CSA Standard W117.2 from Canadian Standards Association. Website: [www.csagroup.org](http://www.csagroup.org).

*Battery Chargers*, CSA Standard C22.2 NO 107.2-01 from Canadian Standards Association. Website: [www.csagroup.org](http://www.csagroup.org).

*Safe Practice For Occupational And Educational Eye And Face Protection*, ANSI Standard Z87.1, from American National Standards Institute. Website: [www.ansi.org](http://www.ansi.org).

*Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, NFPA Standard 51B from National Fire Protection Association. Website: [www.nfpa.org](http://www.nfpa.org).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910.177 Subpart N, Part 1910 Subpart Q, and Part 1926, Subpart J. Website: [www.osha.gov](http://www.osha.gov).

*OSHA Important Note Regarding the ACGIH TLV, Policy Statement on the Uses of TLVs and BEIs*. Website: [www.osha.gov](http://www.osha.gov).

*Portable Generator Hazards Safety Alert* from U.S. Consumer Product Safety Commission (CPSC). Website: [www.cpsc.gov](http://www.cpsc.gov).

*Applications Manual for the Revised NIOSH Lifting Equation* from the National Institute for Occupational Safety and Health (NIOSH). Website: [www.cdc.gov/NIOSH](http://www.cdc.gov/NIOSH).

For Standards regulating hydraulic systems, contact the National Fluid Power Association. Website: [www.nfpa.com](http://www.nfpa.com).

*Battery Service Manual* from the Battery Council International. Website: [www.batteryCouncil.org](http://www.batteryCouncil.org).

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## 2-8. Informations relatives aux CEM

Le courant électrique qui traverse tout conducteur génère des champs électromagnétiques (CEM) à certains endroits. Le courant issu d'un soudage à l'arc (et de procédés connexes, y compris le soudage par points, le gougeage, le découpage plasma et les opérations de chauffage par induction) crée un champ électromagnétique (CEM) autour du circuit de soudage. Les champs électromagnétiques produits peuvent causer interférence à certains implants médicaux, p. ex. les stimulateurs cardiaques. Des mesures de protection pour les porteurs d'implants médicaux doivent être prises: par exemple, des restrictions d'accès pour les passants ou une évaluation individuelle des risques pour les soudeurs. Tous les soudeurs doivent appliquer les procédures suivantes pour minimiser l'exposition aux CEM provenant du circuit de soudage:

1. Rassembler les câbles en les torsadant ou en les attachant avec du ruban adhésif ou avec une housse.
2. Ne pas se tenir au milieu des câbles de soudage. Disposer les câbles d'un côté et à distance de l'opérateur.
3. Ne pas courber et ne pas entourer les câbles autour de votre corps.
4. Maintenir la tête et le torse aussi loin que possible du matériel du circuit de soudage.
5. Connecter la pince sur la pièce aussi près que possible de la soudure.
6. Ne pas travailler à proximité d'une source de soudage, ni s'asseoir ou se pencher dessus.
7. Ne pas souder tout en portant la source de soudage ou le dévidoir.






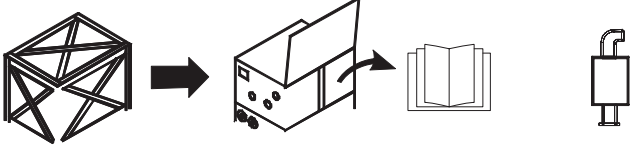

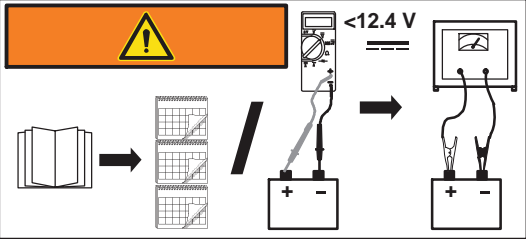
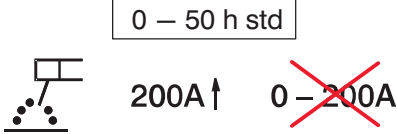
### En ce qui concerne les implants médicaux :

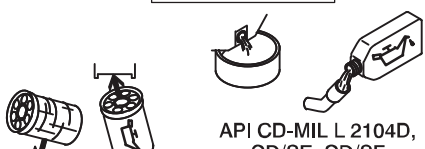
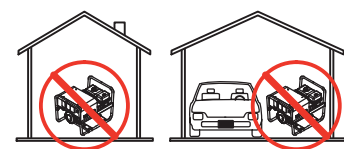
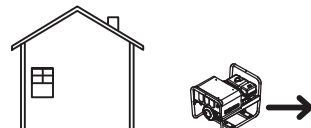
Les porteurs d'implants doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de soudage par points, de gougeage, du coupage plasma ou de chauffage par induction. Si le médecin approuve, il est recommandé de suivre les procédures précédentes.

## SECTION 3 – DEFINITIONS

### 3-1. Additional Safety Symbol Definitions





Some symbols are found only on CE products.



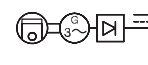





	<p>Warning! Watch Out! There are possible hazards as shown by the symbols.</p>
	<p>Do not discard product (where applicable) with general waste. Reuse or recycle Waste Electrical and Electronic Equipment (WEEE) by disposing at a designated collection facility. Contact your local recycling office or your local distributor for further information.</p>
	<p>Do not use ether or other starting fluids. Using starting fluids voids warranty. See engine Owner's Manual.</p>
	<p>Hot muffler and exhaust pipe can cause severe burns.</p>
	<p>Welding, cutting, drilling, or grinding on base can cause fire or explosion.</p>
	<p>Remove unit from shipping crate. Remove Owner's Manual from unit. Follow instructions to install muffler.</p>
	<p>Read Owner's Manual. Read labels on unit.</p>
	<p>Read Owner's Manual for battery maintenance information.</p>
	<p>During the first 50 hours of operation keep welding load above 200 amperes. Do not weld below 200 amperes of output.</p>












<p style="text-align: center;">50 h std</p>  <p style="text-align: center;">API CD-MIL L 2104D, CD/SE, CD/SF</p>	<p>After the first 50 hours of operation, change the engine oil and filter.</p>
	<p>Never use generator inside a home or garage, even if doors and windows are open.</p>
	<p>Only use generator outside and far away from windows, doors, and vents.</p>












### 3-2. Miscellaneous Symbols And Definitions




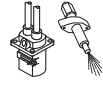
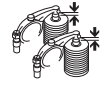





<b>A</b>	Amperage
<b>V</b>	Voltage
<b>S</b>	Suitable For Welding In An Environment With Increased Risk Of Electric Shock
<b>≡</b>	Direct Current (DC)
<b>X</b>	Duty Cycle
<b>I<sub>2</sub></b>	Rated Welding Current
<b>U<sub>2</sub></b>	Conventional Load Voltage
<b>U<sub>0</sub></b>	Rated No-Load Voltage (OCV)
<b>I</b>	Current
<b>U<sub>r</sub></b>	Reduced Rated No Load Voltage
<b>IP</b>	Internal Protection Rating

<b>P<sub>1max</sub></b>	Maximum Power Consumption
	Settings
<b>n</b>	Rated Load Speed
<b>n<sub>0</sub></b>	Rated No-Load Speed
<b>n<sub>1</sub></b>	Rated Idle Speed
<b>Hz</b>	Hertz
<b>h</b>	Hours
<b>s</b>	Seconds
	Clock, Time Switch
	Hour Meter
	Alternating Current (AC)

<b>1</b> 	Single Phase
<b>3</b> 	Three Phase
	Engine-Driven 3-Phase Alternator With Rectifier
<b>-</b>	Negative
<b>+</b>	Positive
	Protective Earth (Ground)
	Circuit Breaker
	Output
<b>I</b>	On
	Increase/Decrease Of Quantity (Rotating)
	Remote

	Read Operator's Manual
	Welding (General)
	Shielded Metal Arc Welding (SMAW)
	Gas Metal Arc Welding (GMAW)
	Gas Tungsten Arc Welding (GTAW) / Tungsten Inert Gas (TIG) Welding
	Tungsten Inert Gas (TIG) Lift Arc
	Flux Cored Arc Welding (FCAW)
	Air Carbon Arc Cutting (CAC-A)
	Glow Plug
	Engine
	Engine

	Idle (Slow)
	Run (Fast)
	Engine Start (Engine RPM)
	Engine Stop
	Engine Oil
	Fuel
	Engine Coolant
	Engine Coolant Temperature
	Temperature Indication
	Battery (Engine)
	Engine Belt Tension

	Spark Arrester
	Air Filter
	Check Air Filter
	Check Pump/ Injectors
	Check Valve Clearance
	Certified/Trained Mechanic
	Arc Control
	USB
	Push Button
	Press Or Turn Button

## SECTION 4 – SPECIFICATIONS

### 4-1. Serial Number And Rating Label Location

The serial number and rating information for this product is located on the front. Use rating label to determine input power requirements and/or rated output. For future reference, write serial number in space on back cover of this manual.

### 4-2. Software Licensing Agreement

The End User License Agreement and any third-party notices and terms and conditions pertaining to third-party software can be found at <https://www.millerwelds.com/eula> and are incorporated by reference herein.

### 4-3. Information About Default Weld Parameters And Settings

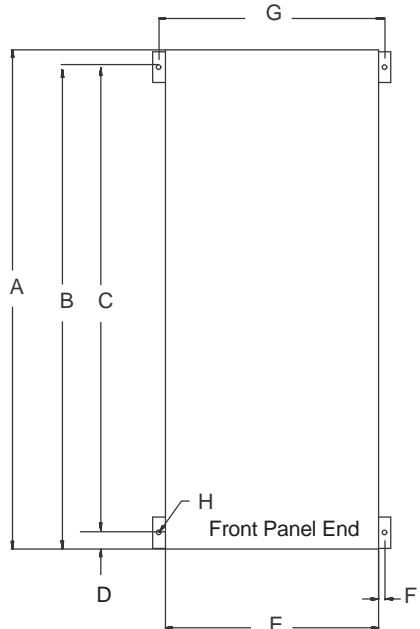

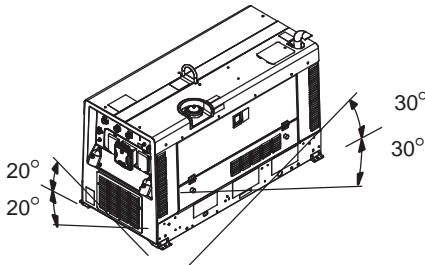
**NOTICE** – Each welding application is unique. Although certain Miller Electric products are designed to determine and default to certain typical welding parameters and settings based upon specific and relatively limited application variables input by the end user, such default settings are for reference purposes only; and final weld results can be affected by other variables and application-specific circumstances. The appropriateness of all parameters and settings should be evaluated and modified by the end user as necessary based upon application-specific requirements. The end user is solely responsible for selection and coordination of appropriate equipment, adoption or adjustment of default weld parameters and settings, and ultimate quality and durability of all resultant welds. Miller Electric expressly disclaims any and all implied warranties including any implied warranty of fitness for a particular purpose.

### 4-4. Weld, Power, And Engine Specifications

This equipment will deliver rated output at an ambient air temperature up to 104°F (40°C).

Engine	Generator Power Rating	Welding Mode	Weld Output Range	Rated Welding Output	Maximum Open-Circuit Voltage	Fuel Capacity
Caterpillar C1.5 Water-Cooled, Three-Cylinder 21.7 HP Diesel Engine	Single-Phase, 10 kVA/kW, 45 A, 220 VAC, 60 Hz; 20 A, 110 VAC, 60 Hz	CC/DC CV/DC	20–400 A 14–40 V	400 A, 24 Volts DC, 100% Duty Cycle	84	11.5 gal (43.5 L)
Kubota V1505 E3BG Water-Cooled, Four-Cylinder 20.2 HP Diesel Engine				350 A, 27 Volts DC, 100% Duty Cycle		
CAT Turbo C1.5T Water-Cooled, Three-Cylinder 24 HP Diesel Engine				300 A, 32 Volts DC, 100% Duty Cycle		

### 4-5. Dimensions, Weights, And Operating Angles

Dimensions			 <p>Do not exceed tilt angles or engine could be damaged or unit could tip.</p> <p>Do not move or operate unit where it could tip.</p> 
Height	32 in. (813 mm) 35.89 in. (912 mm) to top of lift eye		
Width	26 in. (660 mm) (brackets turned in) 28.75 in. (730 mm) (brackets turned out)		
Depth	56.25 in. (1429 mm)		
A	56.25 in. (1429 mm)		
B	54.25 in. (1378 mm)		
C	52.25 in. (1327 mm)		
D	2 in. (51 mm)		
E	26 in. (660 mm)		
F	0.885 in. (22 mm)		
G	27.77 in. (705 mm)		
H	9/16 in. (14 mm) Dia. 4 Holes		
<b>Weight</b>			
<b>No Fuel:</b>			
Kubota: 950 lb (431 kg)			
CAT: 1010 lb (458 kg)			
<b>With Fuel:</b>			
Kubota: 1032 lb (468 kg)			
CAT: 1092 lb (495 kg)			
<b>Lifting Eye Weight Rating:</b>			
2000 lb (907 kg) Maximum			



## 4-6. Environmental Specifications

### A. IP Rating

IP Rating
IP23S
This equipment is designed for outdoor use. It may be stored, but is not intended to be used for welding outside during precipitation unless sheltered.

### B. Information On Electromagnetic Compatibility (EMC)

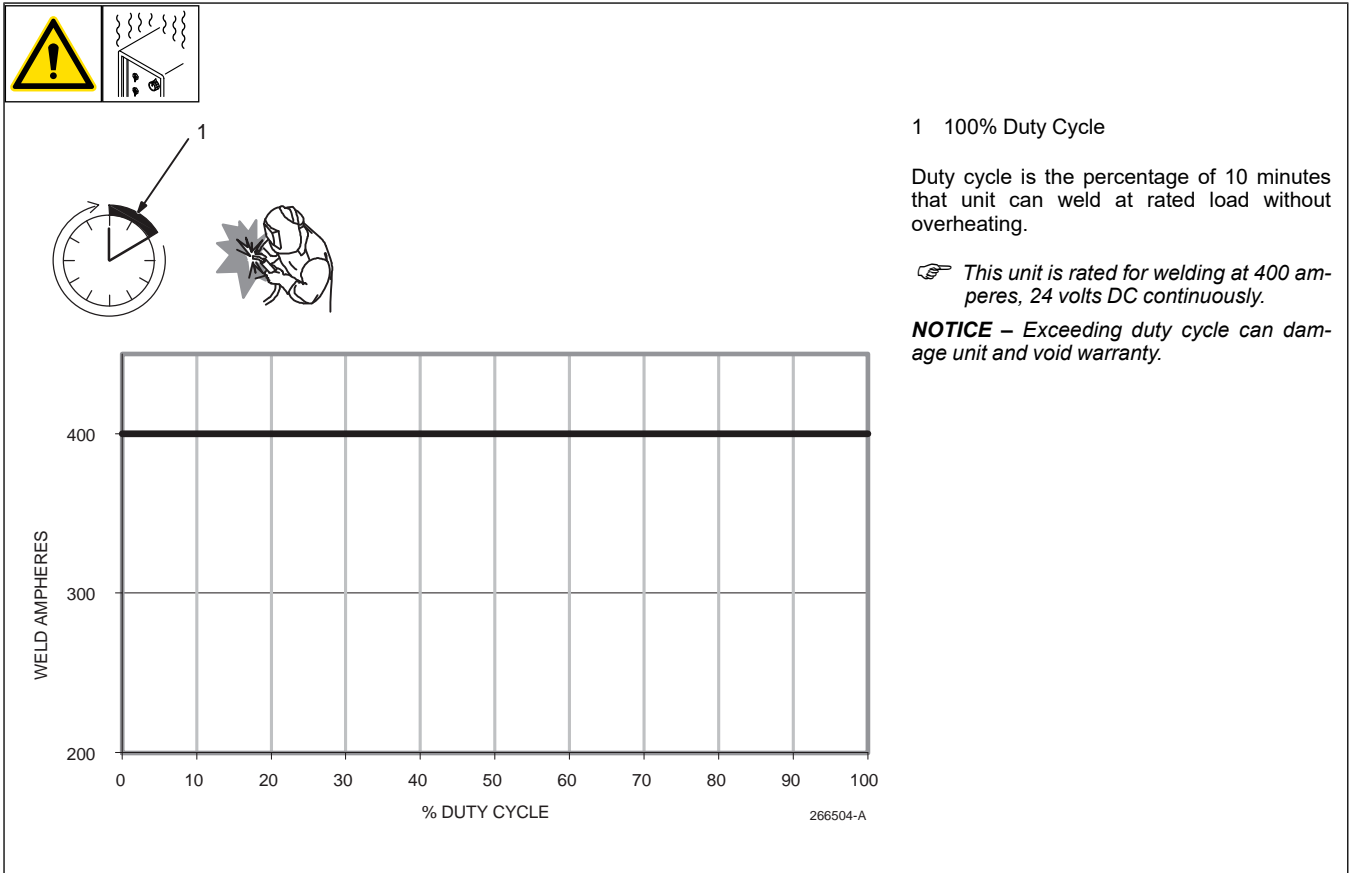
<p><b>⚠</b> This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There can be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated disturbances.</p>
--

### C. Temperature Specifications

Operating Temperature Range*	Storage/Transportation Temperature Range
-40 to 104°F (-40 to 40°C)	-4 to 131°F (-20 to 55°C)

\*Output is derated at temperatures above 104°F (40°C).

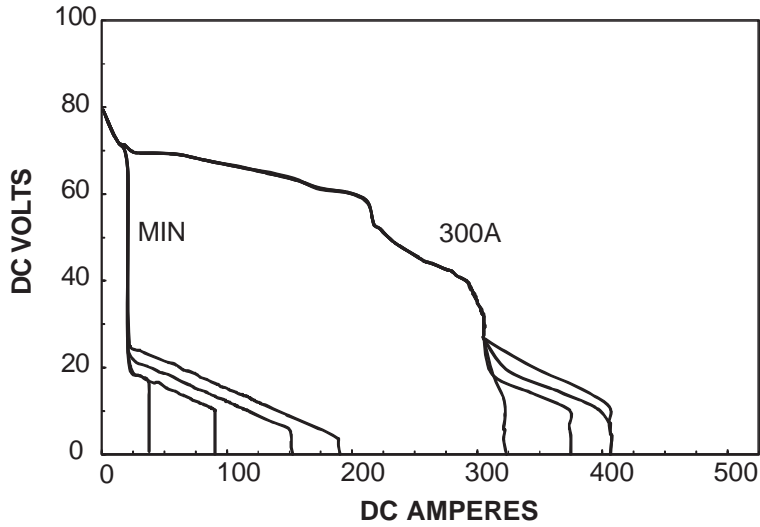
## 4-7. Duty Cycle And Overheating



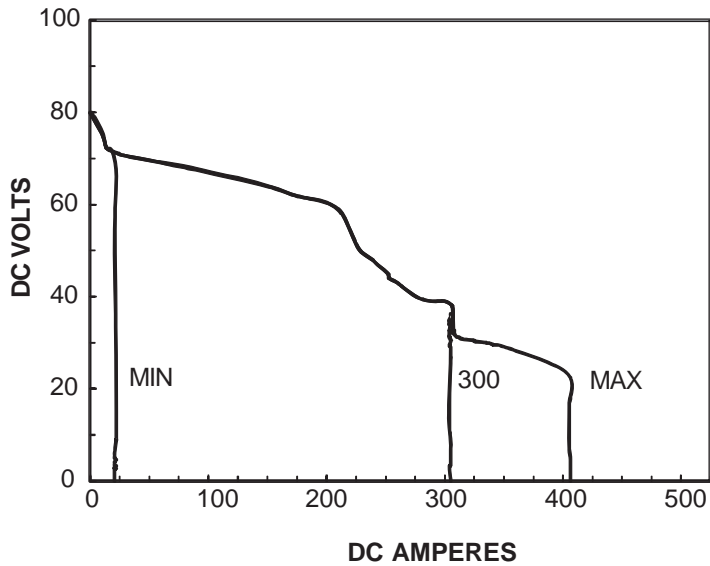
## 4-8. Volt-Ampere Curves

The volt-ampere curve shows the minimum and maximum voltage and amperage output capabilities of the welder/generator. Curves of all other settings fall between the curves shown.

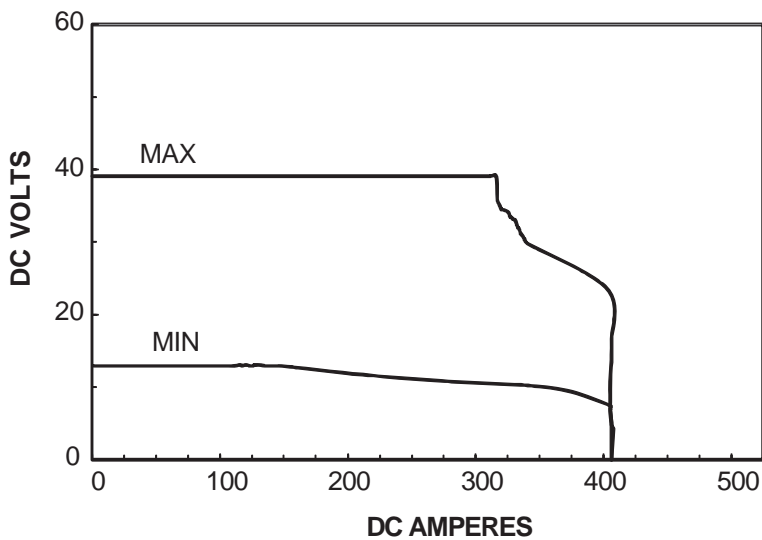
Stick Mode



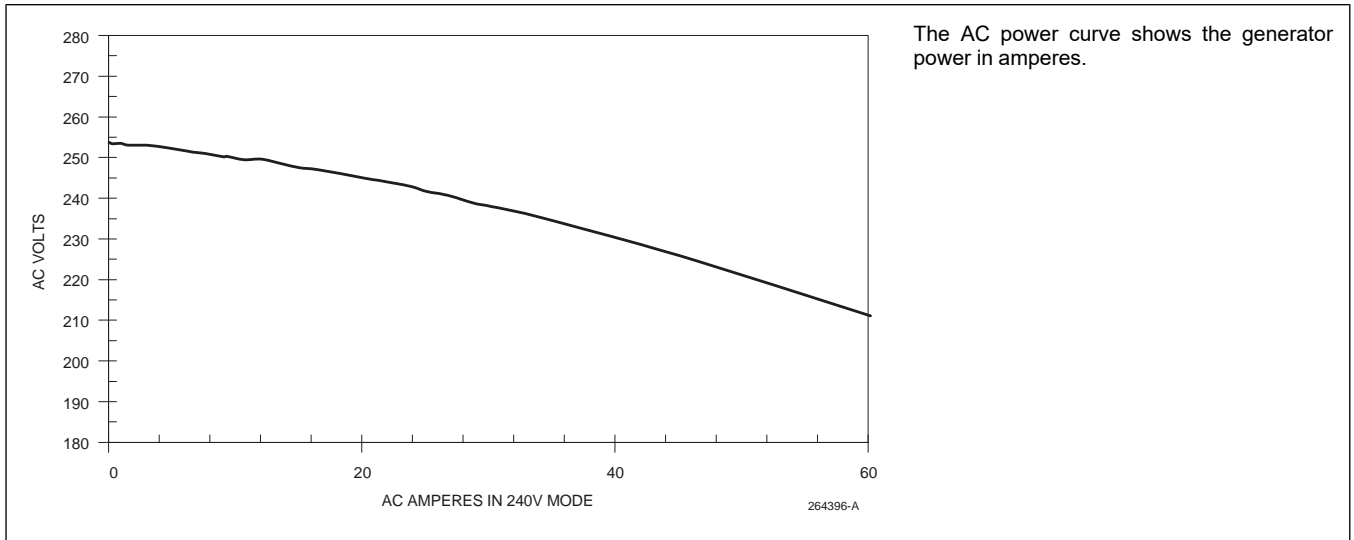
TIG Mode



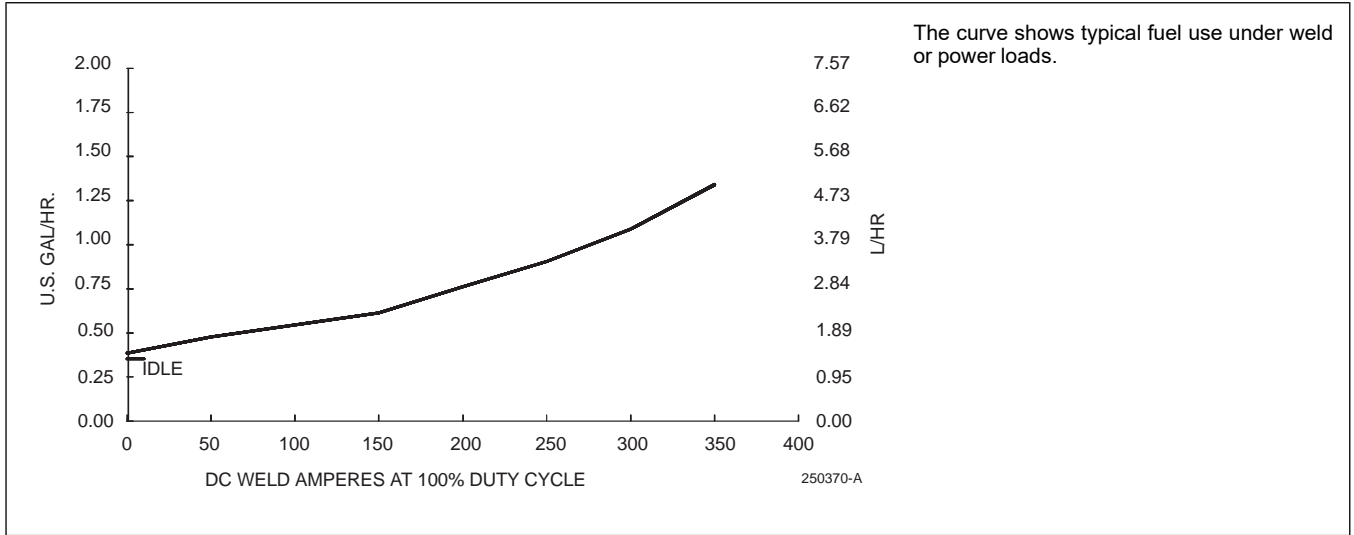
MIG Mode



### 4-9. AC Generator Power Curve

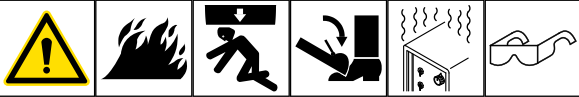


### 4-10. Fuel Consumption

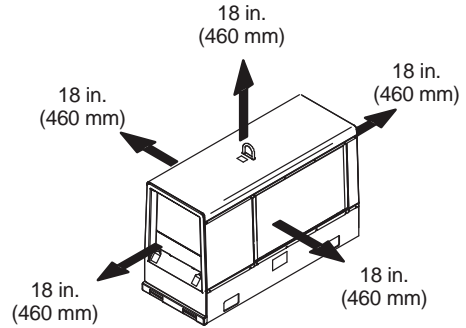
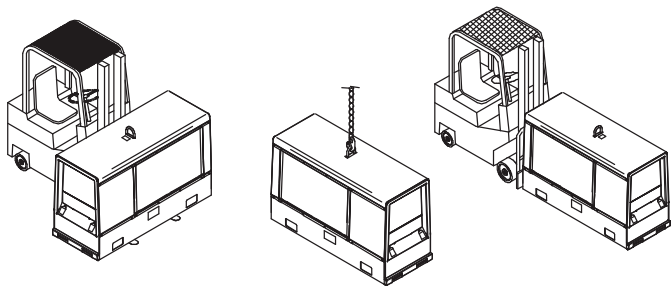


# SECTION 5 – INSTALLATION

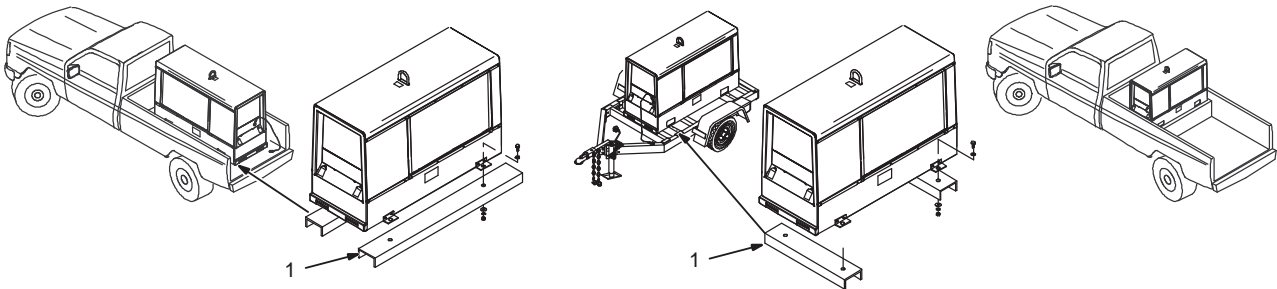
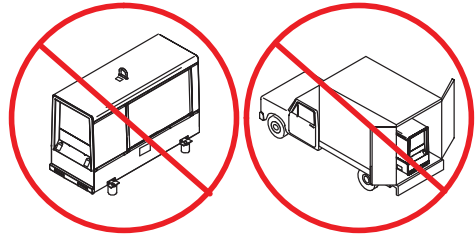
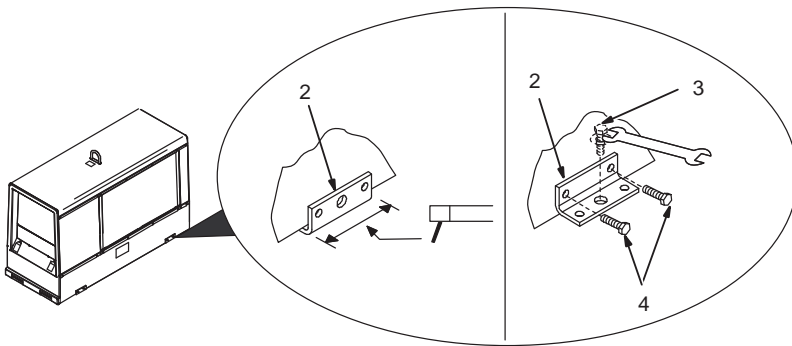
## 5-1. Installing Welder/Generator



### Movement And Airflow Clearance



### Location/Mounting



9/16 in.

Go to [MillerWelds.com](http://MillerWelds.com) for more information on truck installations.

#### Movement

Do not move or operate unit where it could tip.

See Specifications for lifting eye rating.

#### Airflow Clearance

**NOTICE** – Do not install unit where air flow is restricted or engine may overheat.

#### Location/Mounting

Always securely fasten welding generator onto transport vehicle or trailer and comply with all DOT and other applicable codes.

Do not weld on base. Welding on base can cause fuel tank fire or explosion. Weld only on the four mounting brackets or bolt unit down.

**NOTICE** – Do not mount unit by supporting the base only at the four mounting brackets. Use cross-supports to adequately support unit and prevent damage to base.

- 1 Cross-Supports
- 2 Mounting Brackets (Supplied)

Mount unit on flat surface or use cross-supports to support base. Secure unit with mounting brackets.

- 3 1/2 in. Bolt And Washer (Minimum - Not Supplied)

- 4 3/8-16 x 1 in. Screws (Supplied)

#### To Bolt Unit In Place:

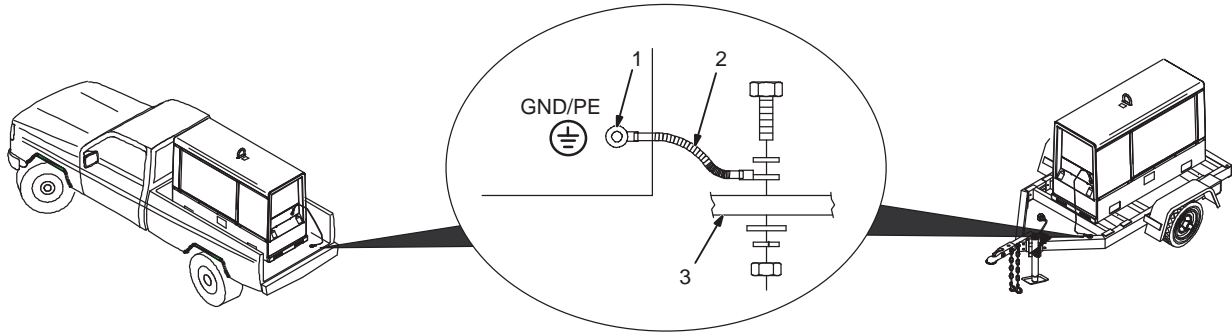
Remove hardware securing the four mounting brackets to the base. Reverse brackets and reattach to base with original hardware.

Mount unit to truck or trailer with 1/2 in. (12 mm) or larger hardware (not supplied).

#### To Weld Unit In Place:

Weld unit to truck or trailer only at the four mounting brackets.

## 5-2. Grounding Generator to Truck or Trailer Frame



**⚠** Always ground generator frame to vehicle frame to prevent electric shock and static electricity hazards.

**⚠** Also see AWS Safety & Health Fact Sheet No. 29, Grounding of Portable And Vehicle Mounted Welding Generators.

**⚠** Bed liners, shipping skids, and some running gear insulate the welding generator from the vehicle frame. Always connect a ground wire from the generator equipment grounding terminal to bare metal on the vehicle frame as shown.

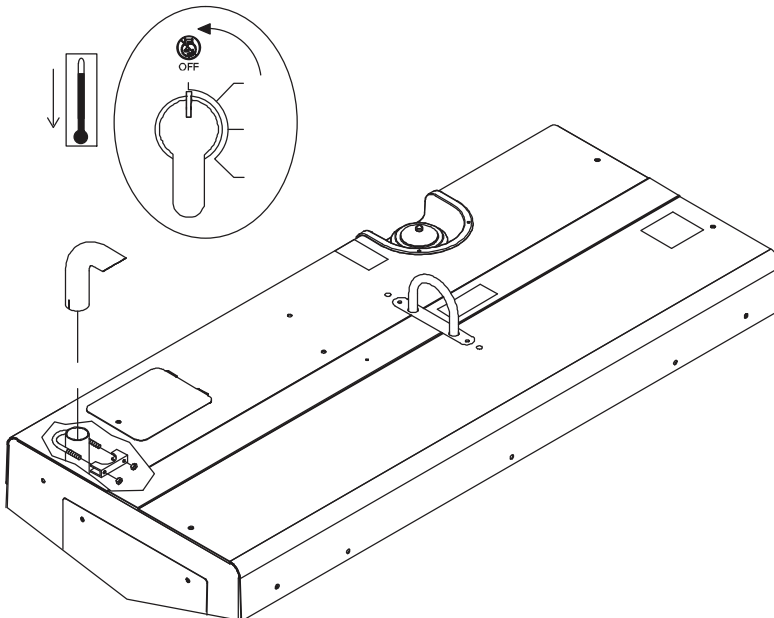
**⚠** Use GFCI protection when operating auxiliary equipment. If unit does not have GFCI receptacles, use GFCI-protected extension cord. Do not use GFCI receptacles to power life support equipment.

- 1 Equipment Grounding Terminal (On Front Panel)
- 2 Grounding Cable (Not Supplied)
- 3 Metal Vehicle Frame

Connect cable from equipment ground terminal to metal vehicle frame. Use #8 AWG or larger insulated copper wire.

*☞ Electrically bond generator frame to vehicle frame by metal-to-metal contact.*

## 5-3. Installing Exhaust Pipe

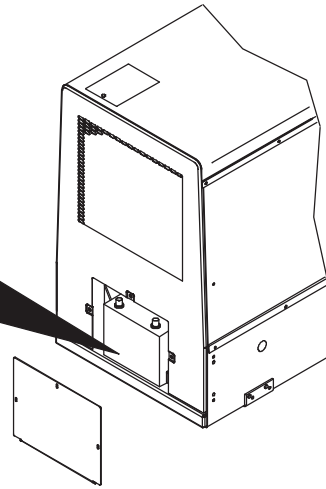
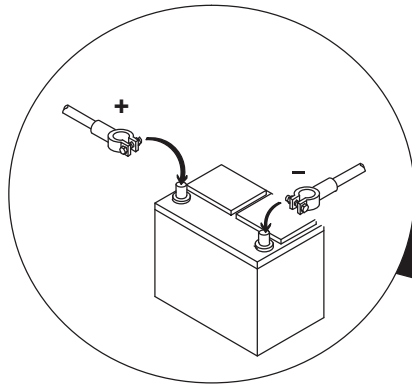
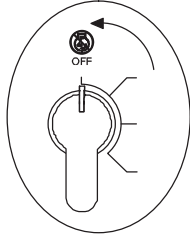
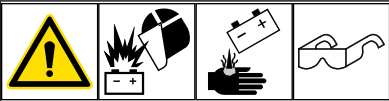



**⚠** Stop engine and let cool.

*☞ Point exhaust pipe in desired direction but always away from front panel and direction of travel.*

1/2 in.

## 5-4. Connecting The Battery



 1/2 in.

**NOTICE** – Lead acid batteries discharge when stored in any temperature. Units that are stored should have the battery recharged every three months and before being put into service. To preserve optimum battery performance and life, recharge battery in storage when the open-circuit voltage drops to 12.4 volts DC when measured across the battery terminals.

**⚠** Connect negative (–) cable last.

**NOTICE** – Wait two minutes after engine shutdown before disconnecting battery or engine controller may be damaged.

Battery is most easily accessed through the rear panel. Remove battery access panel from rear panel. Connect battery, negative cable last. Reinstall battery access panel.

- Do not allow the battery cables to touch opposing terminals. When connecting the battery cables attach the positive (+) cable to the positive (+) battery terminal first, followed by negative (-) cable to negative (-) battery terminal.

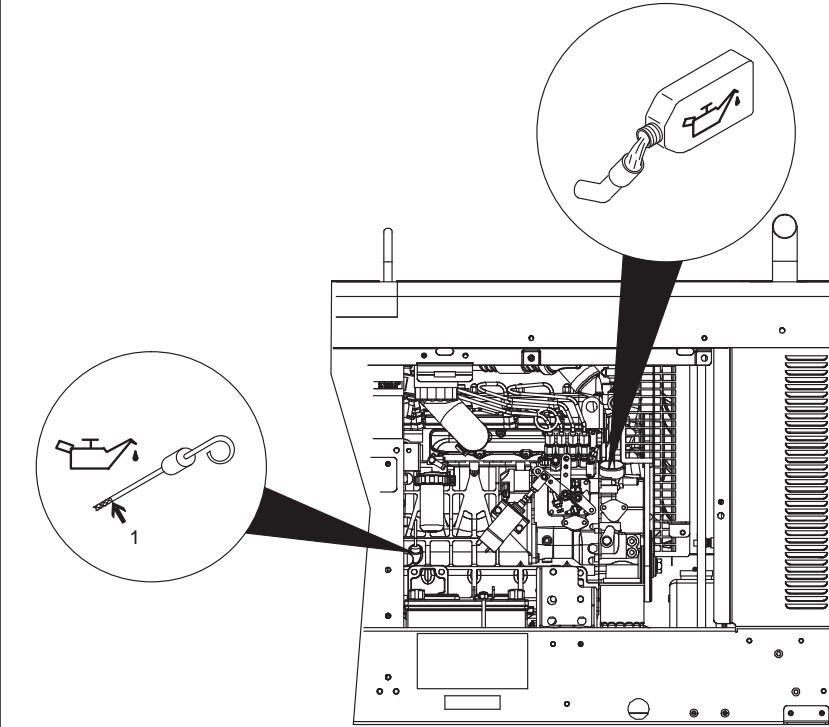
- Never start the engine when the cables are loose or poorly connected to the battery terminals.
- Never disconnect the battery while the engine is running.
- Never use a quick battery charger to start the engine.
- Do not charge battery with Engine Control switch On.
- Always disconnect the negative (-) battery cable before charging battery.

## 5-5. Kubota Engine Oil Prestart Information

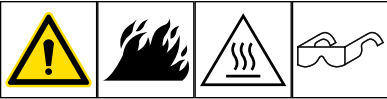


Check oil with unit on level surface. If oil is not up to full mark on dipstick, add oil (see maintenance label).

1 Full

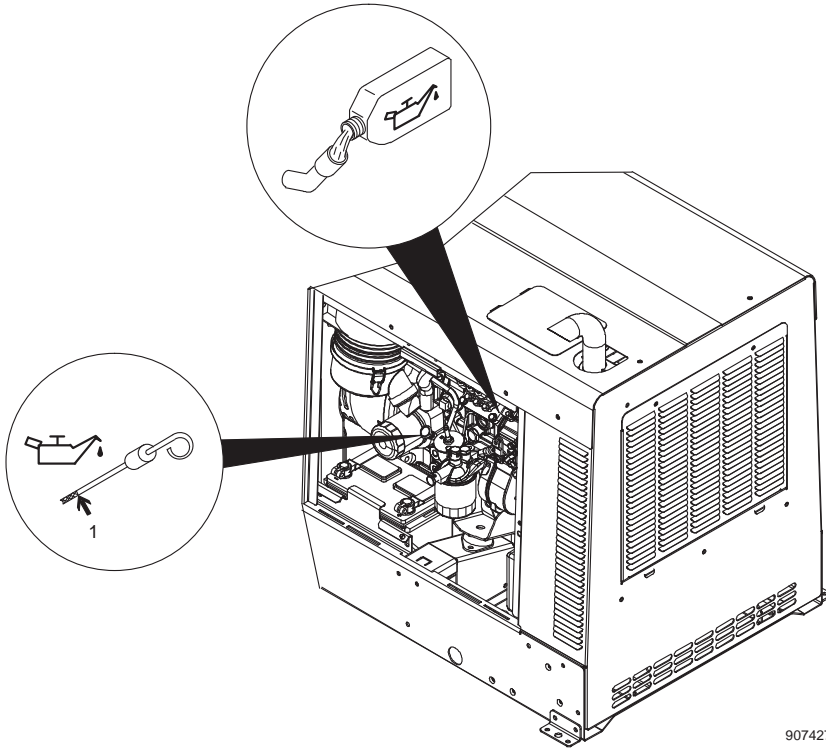


## 5-6. CAT Engine Oil Prestart Information

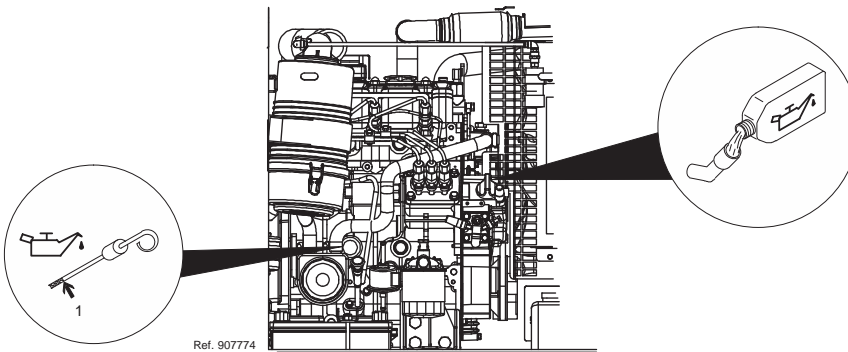


Check oil with unit on level surface. If oil is not up to full mark on dipstick, add oil (see maintenance label).

1 Full



### Turbo Models



## 5-7. Engine General Information

☞ Check all engine fluids daily.

Engine must be cold and on a level surface.

### Automatic Shutdown System

Automatic shutdown system stops engine if oil pressure is too low or coolant temperature is too high.

☞ This unit has a low oil pressure shutdown switch. However, some conditions may cause engine damage before the engine shuts down. Check oil level often and do not use the oil pressure shutdown system to monitor oil level.

### Run-In

Follow run-in procedure in engine manual. If unburned fuel and oil collect in exhaust pipe during run-in, see Section 11.

**NOTICE** – Diesel engines in Miller equipment are meant to operate optimally at moderate to rated load. Light or no load may cause wetstacking or engine damage.

### Cold Weather

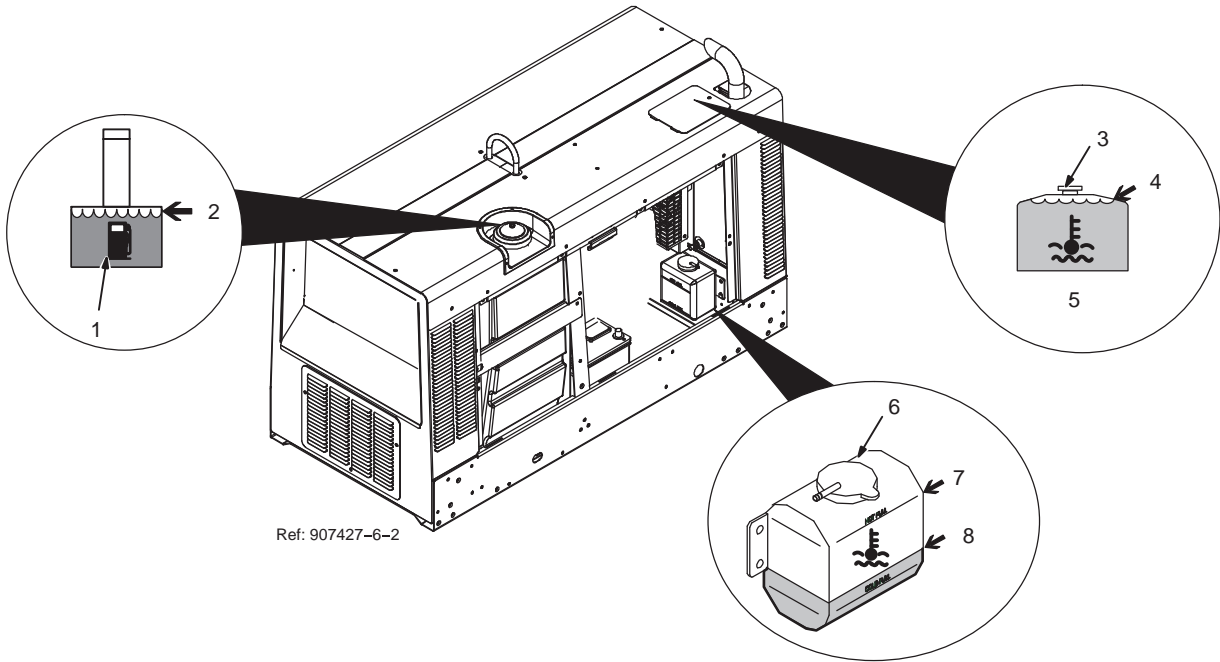
To improve cold weather starting:

- Use Preheat switch (see Section 6-1).
- Keep battery in good condition. Store battery in warm area.

- Use fuel formulated for cold weather (diesel fuel can gel in cold weather). Contact local fuel supplier for fuel information.
- Use correct grade oil for cold weather (see Section 8-3).
- Use engine block heater if applicable (see Section 6-10).



## 5-8. Engine Fuel And Coolant Prestart Information



Ref: 907427-6-2

### Fuel

**NOTICE** – Do not use gasoline. Gasoline will damage engine.

- 1 Diesel Fuel
- 2 Full

Add fresh diesel fuel before starting (see engine maintenance label for fuel specifications). Leave filler neck empty to allow room for expansion.

Engine stops if fuel level is low.

### Coolant

- 3 Radiator
- 4 Full
- 5 Capacity: 6 qt (5.7 L)

- 6 Coolant Recovery Tank

- 7 Hot Full

- 8 Cold Full

Check coolant level in radiator before starting unit the first time. If necessary, add coolant to radiator until coolant level is at bottom of filler neck.

Check coolant level in recovery tank daily. If necessary, add coolant to recovery tank until coolant level is between Cold Full and Hot Full levels. If recovery tank coolant level was low, also check coolant level in radiator. Add coolant if level is below bottom of radiator filler neck.




Check radiator coolant level when fluid is low in recovery tank.


Unit is shipped with an engine coolant mixture of water and ethylene glycol base anti-freeze rated to -34° F (-37° C). Add anti-freeze to mixture if using the unit in temperatures below -34° F (-37° C).

Keep radiator and air intake clean and free of dirt.

**NOTICE** – Incorrect engine temperature can damage engine. Do not run engine without a properly working thermostat and radiator cap.

## 5-9. Weld Output Terminals



Ref: 263480-A

**⚠ Stop engine.**

**⚠ Turn off power before connecting to weld output terminals.**

**⚠ Do not use worn, damaged, undersized, or repaired cables.**

1 Negative (-) Weld Output Terminal




2 Positive (+) Weld Output Terminal

For Stick and TIG welding Direct Current Electrode Positive (DCEP), connect electrode holder cable to Positive (+) terminal on right and work cable to Negative (-) terminal on left.

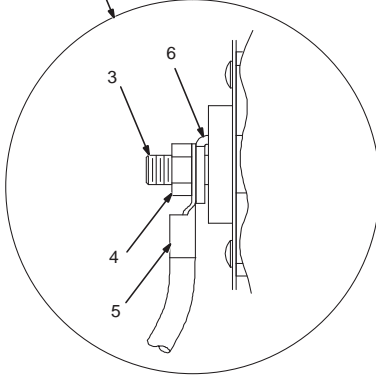
For Direct Current Electrode Negative (DCEN), reverse cable connections.

Use Process/Contactor switch to select type of weld output (see Section 6-3).

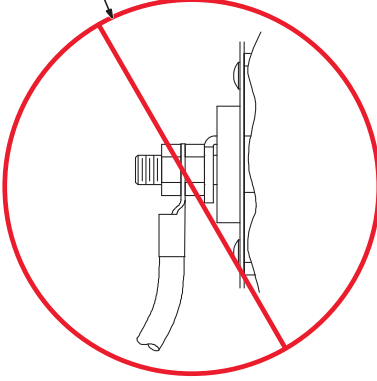
## 5-10. Connecting Weld Output Cables

1



2




**⚠ Stop engine.**

**⚠ Failure to properly connect weld cables may cause excessive heat and start a fire, or damage your machine.**

*Do not place anything between weld cable terminal and copper bar. Make sure that the surfaces of the weld cable terminal and copper bar are clean.*

- 1 Correct Weld Cable Connection
- 2 Incorrect Weld Cable Connection
- 3 Weld Output Terminal
- 4 Supplied Weld Output Terminal Nut
- 5 Weld Cable Terminal
- 6 Copper Bar

Remove supplied nut from weld output terminal. Slide weld cable terminal onto weld output terminal and secure with nut so that weld cable terminal is tight against copper bar.

 3/4 in. (19 mm)

### 5-11. Selecting Cable Sizes\*

**NOTICE** – The Total Cable Length in Weld Circuit (see table below) is the combined length of both weld cables. For example, if the power source is 100 ft (30 m) from the workpiece, the total cable length in the weld circuit is 200 ft (2 cables x 100 ft). Use the 200 ft (60 m) column to determine cable size.

	Weld Cable Size** and Total Cable (Copper) Length in Weld Circuit Not Exceeding***							
	100 ft (30 m) or Less		150 ft (45 m)	200 ft (60 m)	250 ft (70 m)	300 ft (90 m)	350 ft (105 m)	400 ft (120 m)
Welding Amperes	10 - 60% Duty Cycle AWG (mm <sup>2</sup> )	60 - 100% Duty Cycle AWG (mm <sup>2</sup> )	10 - 100% Duty Cycle AWG (mm <sup>2</sup> )					
100	4 (20)	4 (20)	4 (20)	3 (30)	2 (35)	1 (50)	1/0 (60)	1/0 (60)
150	3 (30)	3 (30)	2 (35)	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)	3/0 (95)
200	3 (30)	2 (35)	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	4/0 (120)
250	2 (35)	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	2x2/0 (2x70)	2x2/0 (2x70)
300	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	2x2/0 (2x70)	2x3/0 (2x95)	2x3/0 (2x95)
350	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	2x2/0 (2x70)	2x3/0 (2x95)	2x3/0 (2x95)	2x4/0 (2x120)
400	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	2x2/0 (2x70)	2x3/0 (2x95)	2x4/0 (2x120)	2x4/0 (2x120)
500	2/0 (70)	3/0 (95)	4/0 (120)	2x2/0 (2x70)	2x3/0 (2x95)	2x4/0 (2x120)	3x3/0 (3x95)	3x3/0 (3x95)

\* This chart is a general guideline and may not suit all applications. If cable overheats, use next size larger cable.

\*\*Weld cable size (AWG) is based on either a 4 volts or less drop or a current density of at least 300 circular mils per ampere. ( ) = mm<sup>2</sup> for metric use.

\*\*\*For distances longer than those shown in this guide, see AWS Fact Sheet No. 39, Welding Cables, available from the American Welding Society at <http://www.aws.org>.

### 5-12. Connecting To Remote Receptacle

Remote	Socket*	Socket Information
<b>24 Volts AC Output (Contactor)</b>	A	24 volts AC. Protected by supplementary protector.
	B	Contact closure to A completes 24 volt AC contactor control circuit.
<b>Remote Output Control</b>	C	Output to remote control: +10 volts DC in MIG mode; 0 to +10 volts DC in Stick or TIG mode.
	D	Remote control circuit common.
	E	DC input command signal: 0 to +10 volts from min. to max. of remote control with Voltage/Amperage Adjust control at maximum.
<b>A/V Amperage Voltage</b>	F	Current feedback: 1 volt per 100 amperes.
	H	Voltage feedback: 1 volt per 10 arc volts.
<b>Neutral</b>	G	Circuit common for 24 volt AC circuit.

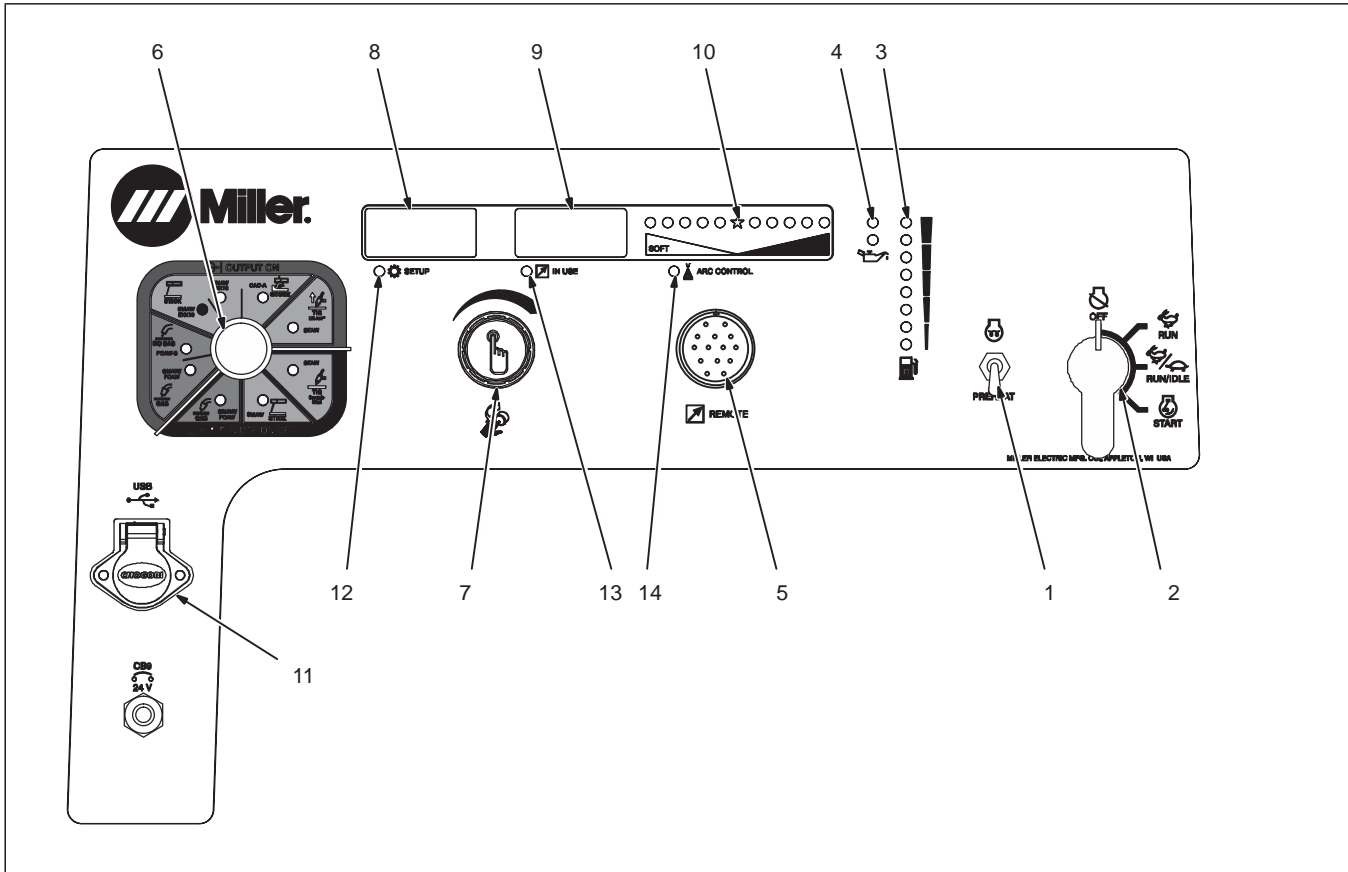
\*The remaining sockets are not used.

☞ Not all models have contactor control. See description of front panel controls and circuit diagram.

☞ Accessories depend on unit capabilities.

## SECTION 6 – OPERATION

### 6-1. Front Panel Controls (See Section 6-2)



## 6-2. Description Of Front Panel Controls (See Section 6-1)



### Engine Starting Controls

#### 1 Preheat Switch

Use switch to energize starting aid for cold weather starting (see starting instructions following).

#### 2 Engine Control Switch

Use switch to start engine, select engine speed, and stop engine.

In Run position, engine runs at weld/power speed. In Run/Idle position, engine runs at idle speed at no load and weld speed with load applied.

*To check engine hours when engine is not running, turn Engine Control switch to Run position. To check remaining oil change hours when engine is not running, turn Engine Control switch to Run/Idle position.*

*For best performance when welding above 300 amperes, place Engine Control switch in Run position.*

**NOTICE** – Diesel engines in Miller equipment are meant to operate optimally at moderate to rated load. Using light or no load for extended periods of time may cause wet-stacking or engine damage.

#### To Start:

**NOTICE** – Do not use ether or other starting fluids. Using starting fluids voids warranty.

*If engine does not start, let engine come to a complete stop before attempting restart.*

**Above 32° F (0° C):** turn Engine Control switch to Start. Release Engine Control switch when engine starts.

**Below 32° F (0° C):** turn engine control switch to Run position. Push Preheat switch up for 6 seconds. Turn Engine Control switch to Start. Release Engine Control switch and Preheat switch when engine starts.

*Do not operate Preheat switch for more than 20 seconds at a time.*

#### To Stop:

Turn Engine Control switch to Off position.

### Engine Gauges, Meters, And Lights

*See Section 6-13 for complete fuel, hour, and engine shutdown information.*

#### 3 Fuel Gauge

Use gauge to check fuel level.

#### 4 Engine Service Indicator Lights

Notifies user that engine oil service is due. Upper LED illuminates when engine oil change hours are between 49-1. Lower LED illuminates when oil change hours are 0 or less.

### Weld Controls

#### 5 Remote Control Receptacle

Use receptacle to connect remote controls, wire feeders, and tools requiring 24 VAC.

When a remote control is connected to the Remote receptacle, the Auto Remote Sense (ARS) feature automatically switches voltage/amperage control to the remote control (see Section 6-9).

With remote control connected, weld output is determined by a combination of front panel and remote control voltage/amperage settings.

If no remote control is connected to the Remote receptacle, the front panel Voltage/Amperage control adjusts voltage and amperage.

*If a remote device connected to Remote Receptacle is faulty or is disconnected during operation, the meters display CHEK REMT (see Section 8-15). Clear fault by stopping and restarting the unit or by turning Process/Contactor switch to another position.*

#### 6 Process/Contactor Switch

See Section 6-3 for Process/Contactor switch information.

#### 7 Adjust Control/Select Button

##### Adjust Control

With Process/Contactor Switch in any SMAW or GTAW process, turn Adjust control to adjust preset amperage. With Process/Contactor switch in any FCAW or GMAW process, turn Adjust control to adjust preset voltage.

##### Select Button

Push the control to use as Select button.

*To access Arc Control setting, push and hold Adjust control for 1 second, then release. Rotate counterclockwise to set softer arc control. Rotate clockwise to set stiffer arc control. Push Adjust control in and release to save Arc Control setting. Arc Control setting will time out after 5 seconds of inactivity.*

*To access Service Menu, push and hold Adjust control for 5 seconds, then release. See Section 6-4 for Service Menu operation. Service Menu will time out after 5 seconds of inactivity.*

### Weld Meters

*Weld meters also work in combination to display troubleshooting error codes (see Section 8-15).*

#### 8 DC Voltmeter

Voltmeter displays preset voltage (GMAW/FCAW welding) with contactor off, and actual output voltage with the contactor on. Voltmeter displays voltage at the weld output terminals, but not necessarily the welding arc due to resistance of cable and connections.

To set voltage, turn Process/Contactor switch to GMAW or FCAW position. Turn V/A control until desired voltage is displayed on Voltmeter. When welding is finished, voltmeter displays average weld voltage and then defaults to preset voltage.

#### 9 DC Ammeter

Ammeter displays preset amperage (Stick and TIG only) when not welding, and actual output amperage when welding.

To set amperage, turn Process/Contactor switch to Stick or TIG position. Turn V/A control until desired amperage is displayed on Ammeter. When welding is finished, ammeter displays average weld amperage and then defaults to preset amperage.

#### 10 Arc Control Meter

Displays current Arc Control setting. Default value for all processes is 0. Arc Control settings adjust: DIG for SMAW processes, Auto Stop for GTAW processes, and inductance for FCAW and GMAW processes. For softer settings, the LEDs to the left of the star illuminate. For stiffer settings, the LEDs to the right of the star illuminate. No Arc Control settings are accessible for GTAW Remote and CAC-A processes. See Section 6-5.

### Other Receptacles

#### 11 USB Receptacle

Allows software updates from a USB drive (see Section 6-11). A summary file of recorded data from the unit will be saved to a USB drive that is inserted (see Section 6-12).

### Indicator Lights

#### 12 Setup Light

Illuminates when in the Service Menu.


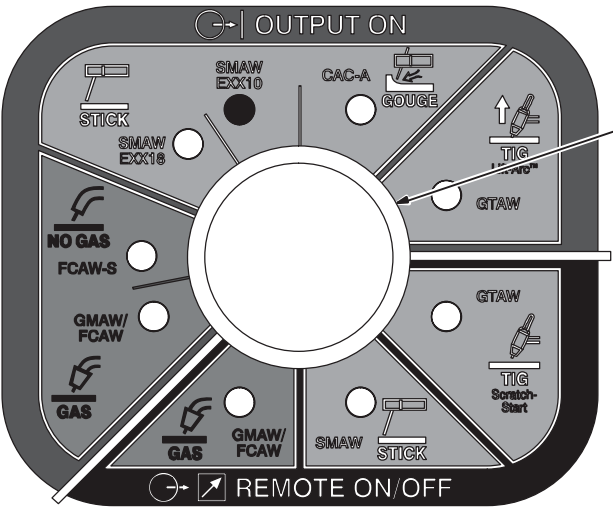
#### 13 In Use Light

Illuminates when connected to an ArcReach accessory.

#### 14 Arc Control Light

Illuminates when in the Arc Control settings.

### 6-3. Process/Contactor Switch

1 Process/Contactor Switch

**⚠ Weld output terminals are energized when Process/Contactor switch is in an Electrode Hot position and the engine is running.**

Use switch to select weld process and weld output on/off control (see table below).

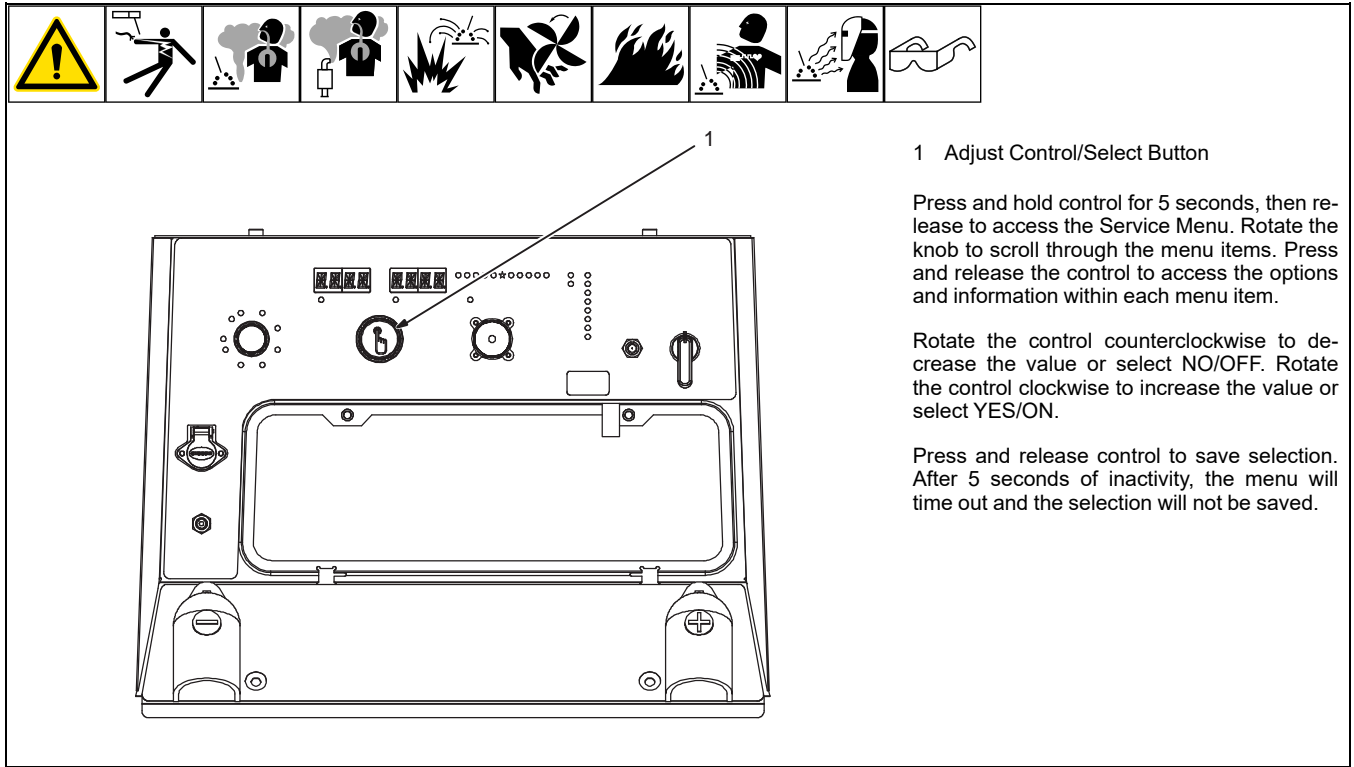
Place switch in Remote On/Off Switch Required positions to turn weld output on and off with a device connected to the Remote receptacle.

Place switch in Output On positions for weld output to be on whenever the engine is running.

Use the Lift-Arc TIG mode for TIG (GTAW) welding using the Lift-Arc TIG starting procedure.

	Process/Contactor Switch Setting	Typical Process Applications (DC Only)
Output On	Output On – GMAW/FCAW (MIG)	MIG solid wire and dual shield flux core use a voltage sensing (VS) feeder that does not require a control cable back to the welder/generator.
	Output On – FCAW-S (Electrode Negative)	FCAW (Flux Cored Arc Welding - self shielded) uses a voltage sensing (VS) feeder that does not require a control cable back to the welder/generator.
	Output On - SMAW (STICK XX18 and STICK XX10)	Stick welding with or without a remote amperage control. Strike an arc to start welding.
	Output On – GTAW (Lift-Arc TIG)	Lift-Arc TIG: touch tungsten to work and lift to start welding. Uses circuitry internal to the welder/generator to aid arc start. Can be used with or without a remote control. Auto to Crater option can be enabled/disabled using the Service Menu.
	Output On – CAC-A (Air Carbon Arc Gouging)	Gouging with or without a remote amperage control. Strike an arc to start gouging.
Remote On/Off Required	Remote ON/OFF Required - GTAW (Remote TIG)	High Frequency TIG or Scratch Start TIG welding. High frequency TIG starting with remote control allows remote On/Off and Amperage control. Another typical application is a simple TIG rig with a remote control device.
	Remote ON/OFF Required - SMAW (Remote Stick)	Stick welding with RHC-14 control allows remote On/Off and Amperage control. This can help eliminate accidental arc strikes.
	Remote ON/OFF Required - GMAW/FCAW (Remote MIG)	MIG solid wire and dual shield flux core using a constant speed feeder. Use feeders with 14-pin remote voltage control, or use a Spoolmatic 30A with WC24 control.

## 6-4. Service Menu



### 1 Adjust Control/Select Button

Press and hold control for 5 seconds, then release to access the Service Menu. Rotate the knob to scroll through the menu items. Press and release the control to access the options and information within each menu item.

Rotate the control counterclockwise to decrease the value or select NO/OFF. Rotate the control clockwise to increase the value or select YES/ON.

Press and release control to save selection. After 5 seconds of inactivity, the menu will time out and the selection will not be saved.

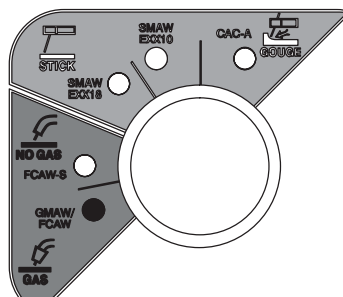
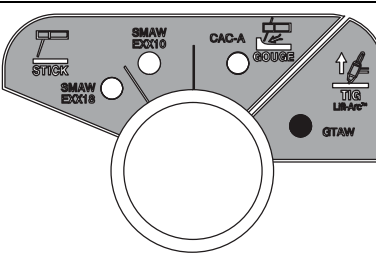
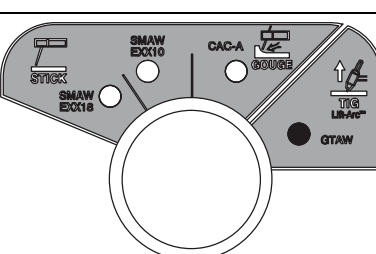
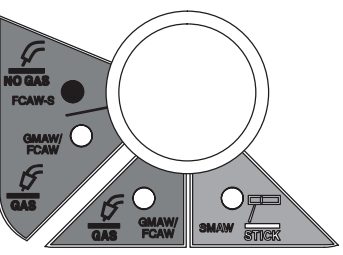
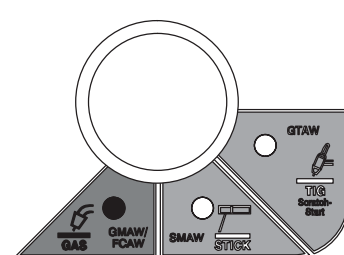
Menu Item	Selectable Item Option(s)	Description
HOT STRT (Only accessible in SMAW processes)	LIMIT OFF	Disables Hot Start option.
	LIMIT 0.50	Sets time the current transitions from hot start to the preset current. Factory preset is 0.5 seconds for both XX10 and XX18. Range is 0 to 1 second settable in 0.1 second increments.
AUTO CRTR (Only accessible in GTAW Lift-Arc)	ATCR ON	Enables Auto Crater option. Auto Crater gradually ramps current down after the Auto-Stop threshold is met. This enables operators to better control the metal at the end of welding and avoid the formation of an undesirable crater while still providing shielding gas.
	ATCR OFF	Disables Auto Crater option.
DIG RNGE	0-150	Sets current limit above preset amperage between 0 and 150 amps for XX10 or 0 and 50 amps for XX18.
HOUR MTR	--	Displays engine hours.
OIL HOUR	--	Displays remaining oil change hours before service is due.
OIL SET	50 HRS	Sets the starting hours for oil change period. Selectable from 50-1500 hours in 50 hour increments.
OIL RSET	RSET YES	Resets oil change period to selected value. Unit is set to factory recommended period per engine manufacturer.
	RSET NO	Oil change remaining hours do not reset.
VRD	VRD ON	Enables VRD (Voltage Reducing Device) option, lowering open-circuit voltage.
	VRD OFF	Disables VRD (Voltage Reducing Device) option.
SOFT WARE	--	Displays the current revision of firmware installed.
FACT RSET	RSET YES	Resets all settings to factory defaults.
	RSET NO	All settings remain at previous settings.

## 6-5. Arc Control Settings

Arc Control is not active when the Process/Contactor switch is in the following positions:

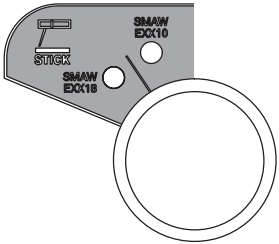
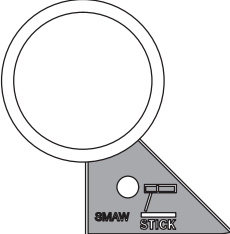
Output On: CAC-A (Air Carbon Arc Gouging)

Remote ON/OFF: GTAW (Remote TIG)

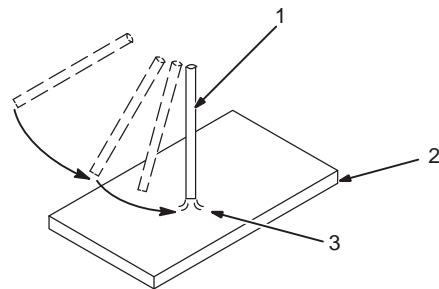
Process/Contactor Switch	Arc Control	
 <p>Voltage sensing feeder</p>	SOFT (25 to 1)	Starting point for stainless steel wire (high inductance) <input type="text" value="SOFT"/> <input type="text" value="-12"/>
	★ (0)	Starting point for mild steel wire
	STIFF (1 to 25)	Starting point for aluminum wire (low inductance) <input type="text" value="STIF"/> <input type="text" value="12"/>
	STOP (-5 to -1)	Auto-Crater off (see Service Menu). More sensitive Auto-Stop
	★ (0)	Starting point.
	STOP (1 to 5)	Less sensitive Auto-Stop Auto-Stop determines the arc length (voltage) threshold the operator must exceed to terminate the arc. If arc terminates prematurely, increase the Auto-Stop.
	STOP (-5 to -1)	Auto Crater on (see Service Menu). More sensitive Auto-Crater initiation.
	★ (0)	Starting point
	STOP (1 to 5)	Less sensitive Auto-Crater initiation
	SOFT (25 to 1)	
	★ (0)	Starting point
	STIFF (1 to 25)	
 <p>Wire feeder connects to Remote receptacle</p>	SOFT (25 to 1)	Starting point for stainless steel wire (high inductance) <input type="text" value="SOFT"/> <input type="text" value="-12"/>
	★ (0)	Starting point for mild steel wire
	STIFF (1 to 25)	Starting point for aluminum wire (low inductance) <input type="text" value="STIF"/> <input type="text" value="12"/> Starting point for dual shield flux core, vertical overhead <input type="text" value="STIF"/> <input type="text" value="25"/>



## 6-6. Dynamic Dig Settings

Process/Contactor Switch	Arc Control	
	<b>SOFT</b> (25 to 1)	Softer, slower responding arc
	★ (0)	Starting point for XX10 electrode/open root vertical down joint
	<b>STIFF</b> (1 to 25)	Stiffer, more rapidly responding arc
	<b>Dig Range XX10</b>	
	(0)	Softer arc that minimizes or eliminates undercut
	(100)	Starting point for downhill pipe (factory default)
(150)	Stiffer arc with greater penetration	
<b>Dig Range XX18</b>		
(0)	Softer arc that minimizes or eliminates undercut	
(25)	Starting point for all XX18 welding applications	
(50)	Stiffer arc with greater penetration	
	<b>Arc Control</b>	
	<b>SOFT</b> (25 to 1)	Softer, slower responding arc
	★ (0)	Starting point for XX10, XX11, XX13, XX14, XX18, XX24, and XX22 electrodes
	<b>STIFF</b> (1 to 25)	Stiffer, more rapidly responding arc
	<b>Dig Range</b>	
	(0)	Starting point for XX18 rod <div style="border: 1px solid black; padding: 2px; display: inline-block;">DIG RANGE</div> <span style="border: 1px solid black; padding: 2px; margin-left: 10px;">25</span>
(100)	Starting point for downhill pipe (factory default) <div style="border: 1px solid black; padding: 2px; display: inline-block;">DIG RANGE</div> <span style="border: 1px solid black; padding: 2px; margin-left: 10px;">100</span>	
(150)		

## 6-7. Stick Start Procedure—Scratch Start Technique



With Stick selected, start arc as follows:

- 1 Electrode
- 2 Workpiece
- 3 Arc

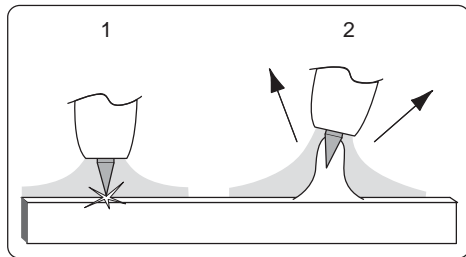
Drag electrode across workpiece like striking a match; lift electrode slightly after touching work. If arc goes out electrode was lifted too high. If electrode sticks to workpiece, use a quick twist to free it.

Miller recommends Hobart filler metals.

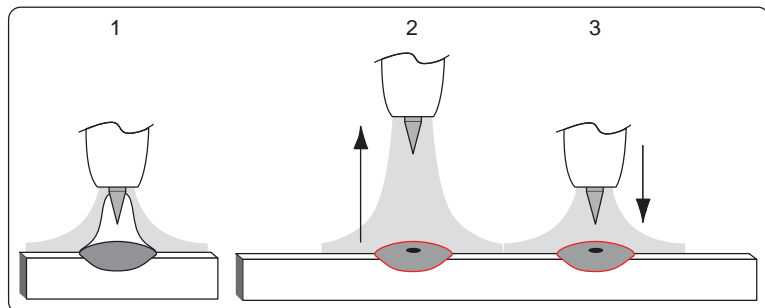
## 6-8. Lift-Arc™ TIG With Auto-Stop™ And Auto-Crater™



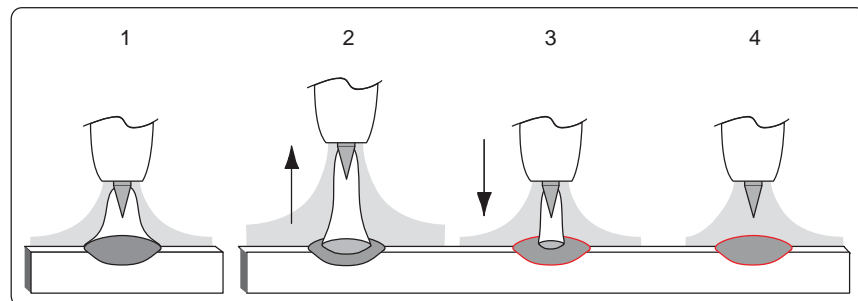
### Arc Start With Lift-Arc



### Arc End With Auto-Stop



### Arc End With Auto-Crater



### Arc Start With Lift-Arc TIG

Lift-Arc is used for the DCEN GTAW process when HF Start method is not permitted.

Select Lift-Arc at Process/Contactor switch.

Turn gas on.

1. Touch or scratch.
2. Lift at any angle.

Touch tungsten electrode to workpiece at weld start point. Slowly lift electrode. Arc is started when electrode is lifted.

Maintain shielding gas coverage and eliminate tungsten and workpiece contamination by using Auto-Crater or Auto-Stop to end the arc.

### Arc End With Auto-Stop

1. While welding.
2. Lift torch to start Auto-Stop. Arc stops.
3. Move torch back down to maintain gas coverage and prevent contamination.

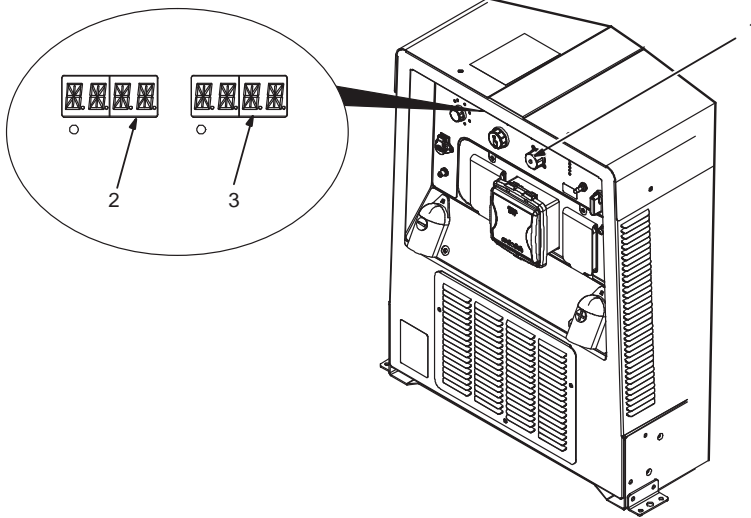
### Arc End With Auto-Crater

☞ Remote control is not needed when using Auto-Crater.

1. While welding.
2. Lift torch slightly to start Auto-Crater end (current is reduced).
3. Lower torch. Weld current ramps down.
4. Shielding gas continues until shut off.

☞ Miller recommends Hobart filler metals.

## 6-9. Remote Voltage/Amperage Control



### 1 Remote Receptacle

Connect optional remote control to receptacle (see Section 5-12).

*When a remote control is connected to the Remote receptacle, the Auto Remote Sense feature automatically switches voltage/amperage control to the remote control. When a device is connected to the Remote receptacle, remote voltage/amperage control is always available regardless of the position of the Process/Contactor switch.*

### 2 Voltmeter

### 3 Ammeter

### CC Welding

Connect remote control to remote receptacle. Set TIG or STICK process.

Turn remote control On. Adjust optional remote control to 100%.

Voltmeter shows open-circuit voltage when not welding, arc voltage while welding.

Ammeter shows preset output when not welding, actual amperage while welding.

Set V/A control to desired maximum weld output using weld meters.

Adjust optional remote control to desired weld output (max 205 A DC, min 20 A DC).

### CV Welding

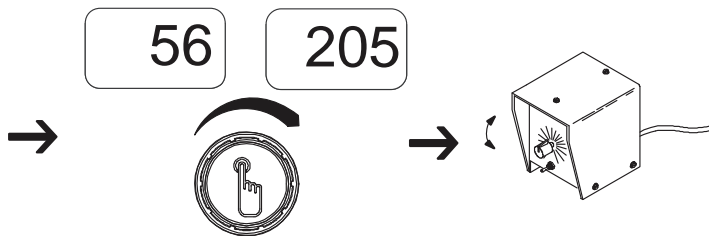
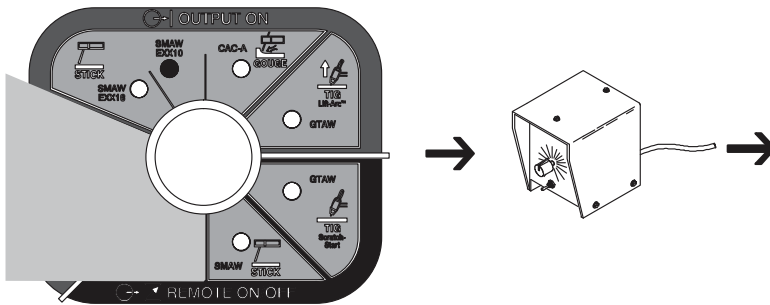
Connect remote control to remote receptacle. Set WIRE process.

Voltmeter toggles between preset and actual output when not welding, actual voltage while welding.

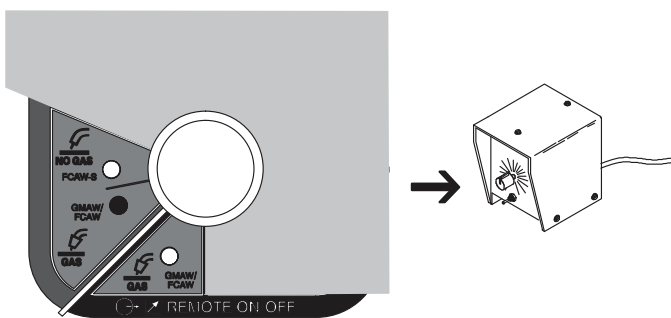
Ammeter shows zero.

Turn remote control On. Adjust optional remote control to desired weld output.

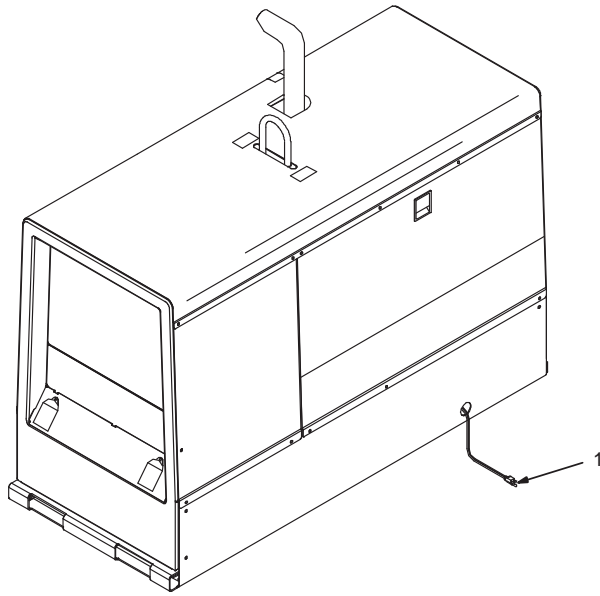
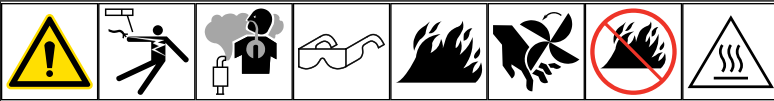
### CC Welding



### CV Welding



## 6-10. Operating Engine Block Heater



### 1 Engine Block Heater Plug

Use heater to maintain a constant engine coolant temperature.

To turn on heater, connect heater plug to 120 volts AC receptacle.

**⚠ Do not run engine while engine block heater is on.**

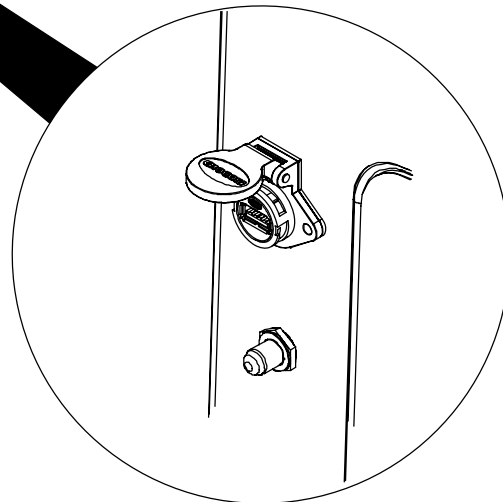
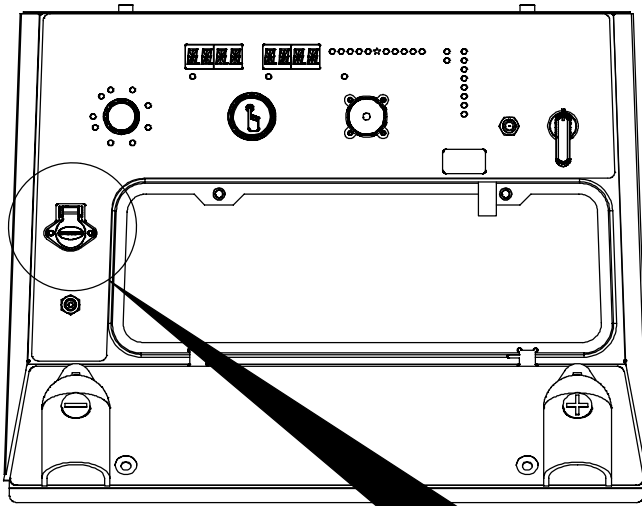
**NOTICE** – In extremely cold weather, heater should be connected to power source when engine is warm.

**⚠ The area near the engine block heater gets hot.**

Disconnect plug to turn off heater.

Heater Specifications		
Engine	Watts	Volts $\pm 10\%$
CAT	1000	120

## 6-11. Updating Software



Obtain the latest firmware to be loaded from [MillerWelds.com](http://MillerWelds.com)

Copy the desired firmware to an approved USB flash drive.

With the machine turned off, insert the flash drive into the USB receptacle on the front of the machine. Turn the Engine Control switch to the Run or Run/Idle position.

☞ *Do not start the engine.*

When the machine has powered up, if valid files exist on the flash drive, the user is prompted to confirm the start of the download. The Voltmeter/Ammeter display reads: AL? NO.

Confirm by rotating the Adjust Control/Select button clockwise to select YES. Then press the Select button.

☞ *After the update has started, do not power down or remove the flash drive until the update is complete.*

During the download, the left meter display indicates the active download with ALLC, ALLW, AL C, or AL W. The right meter display indicates the percentage of the download completed with a number from 0 to 100.

When the update has completed successfully, the machine restarts.

Failures are indicated on the meter display. Correction of failed updates depends on what type of failure occurred.

## 6-12. Summary File

### 1 Summary File

Each time a USB stick is inserted in the USB receptacle, a summary file is saved to the USB stick as SummaryFile.txt.

"USB ACC" will display as the file is written. File is complete when display no longer shows "USB ACC."

The summary file provides diagnostic and weld information.

#### Status Summary

\*\* Firmware Revisions \*\*  
 Master Comm Processor  
 App Rev .....: 276588A  
 App Loader Rev.: 276587A  
 Launcher Rev...: 276586A  
 Performer Changelist - App.....: 36878  
 Performer Changelist - App Loader: 36755  
 Performer Changelist - Launcher...: 36755

Master weld Processor  
 App Rev .....: 276589A  
 App Loader Rev.: 276591A  
 Launcher Rev...: 276590A  
 Performer Changelist - App.....: 36855  
 Performer Changelist - App Loader: 36855  
 Performer Changelist - Launcher...: 36855

\*\* Usage \*\*  
 Engine On Time ....: 348h 26m 57s


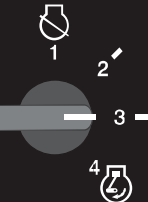
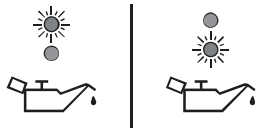
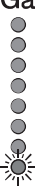

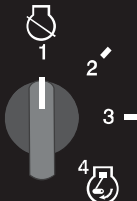
Process	Arc Count	Arc Time
Carbon Arc Gouge	2	0h 2m 12s
Lift-Arc TIG	10	2h 16m 6s
TIG Remote	1	0h 2m 31s
Stick Remote	19	8h 51m 41s
MIG Remote Solid	0	0h 0m 0s
MIG Solid	102	107h 41m 28s
MIG Flux-Core	0	0h 0m 0s
Stick XX18	81	96h 8m 4s
Stick XX10	3	0h 49m 37s
TIG AutoCrater	0	0h 0m 0s
<b>Totals</b>	<b>218</b>	<b>215h 51m 39s</b>

\*\* Temperatures \*\*  
 IGBT1 Module .....: 61°C  
 IGBT2 Module .....: 61°C

\*\*Error Code Log\*\*  
 Most Recent Errors:  
 S/W BLD  
 IGBT2OPN  
 S/W ERR

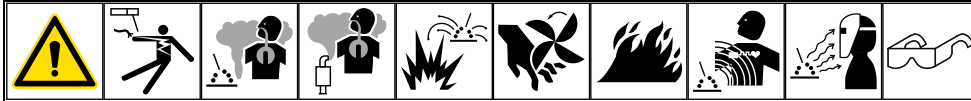
Error List	Count
MAX POWR	0
CHEKREMT	0
IGBT1SHT	0
IGBT1OPN	15
IGBT2SHT	0
IGBT2OPN	15
IGBTTEMP	0
OIL PRES	0
H2O TEMP	0
LOW FUEL	20
S/W ERR	5
S/W BLD	5

## 6-13. Fuel/Hour Gauge Descriptions

Fuel, Hour, and Engine Shutdown Descriptions		
LH Display <b>HOUR</b>	RH Display <b>0000</b>	<b>ENGINE HOURS:</b> To display engine hours while the engine is off, place Engine Control switch in position "2". 
LH Display <b>OIL</b>	RH Display <b>0499</b>	<b>OIL CHANGE INTERVAL:</b> To display hours remaining before oil change is due, place Engine Control switch in position "3" (with engine off). 
<b>Service Indicator Lights</b>  Remaining Hrs. <50 If equipped		<b>OIL CHANGE DUE:</b> Service indicator light will illuminate Red when service is due.  To Reset: Press and hold Control/Select knob for 5 sec. to access service menu, scroll to RSET, press knob, scroll to select YES, press knob to reset.
<b>Fuel Gauge*</b>  *If equipped		<b>LOW FUEL PREWARNING:</b> Last LED in fuel gauge is illuminated steady.  <b>LOW FUEL:</b> Fuel level low when last LED in fuel gauge blinks.
LH Display* <b>LOW</b>	RH Display* <b>FUEL</b>	<b>NO FUEL:</b> Engine shuts down before fuel runs out. Display shows "LOW FUEL."  To Reset: Refuel.
LH Display <b>OIL</b>	RH Display <b>PRES</b>	<b>LOW OIL PRESSURE:</b> Engine shuts down when oil pressure is low. Display shows "OIL PRES."  To Reset: Place Engine Control switch in OFF position. 
LH Display* <b>H2O</b>	RH Display* <b>TEMP</b>	<b>HIGH COOLANT TEMP:</b> Engine shuts down when coolant temperature is high. Display shows "H2O TEMP."  To Reset: Place Engine Control switch in OFF position. 
Note: Switch positions are numbered to illustrate that there are four switch positions. Actual graphics on front panel will vary.		

278439-B

## 6-14. Associating ArcReach Devices (ArcReach Models Only)



**⚠ Stop engine.**

**NOTICE** – Do not exceed machine duty cycle.

### Associating ArcReach Device To Engine Driven Welder/Generator

Make connections between welder/generator and ArcReach device. See Owner's Manual for ArcReach device for typical connection diagrams.

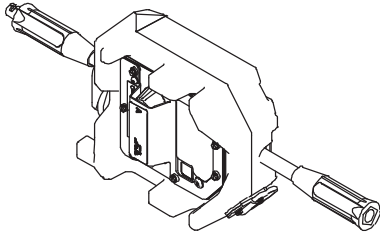
The welder/generator has the ability to associate automatically with an ArcReach device at power up. The Process/Contactor switch must be set to an Output ON mode to associate with an ArcReach device.

See the ArcReach device Owner's Manual to associate the device to the welder/generator.

When the association process is complete, the In Use light will be illuminated. Depending on the capabilities of the ArcReach device, the Process/Contactor switch, Adjust Control/Select button, and Arc Control adjustment may be overridden.

**The following ArcReach accessories are compatible with this welder/generator:**

#### ArcReach Stick/TIG Remote For Stick Or TIG Welding

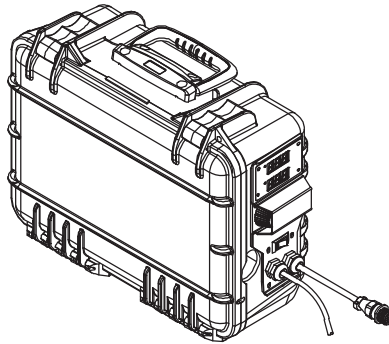


When welder/generator is associated with Stick/TIG Remote:

SMAW processes: Amperage, Electrode Type, and Arc Control settings are adjusted on the remote.

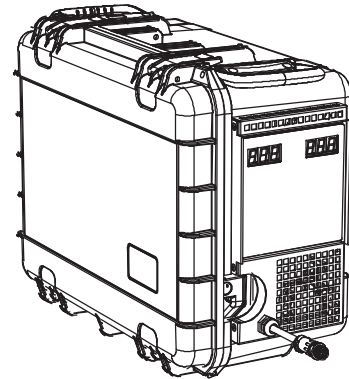
GTAW and CAC-A processes: Amperage settings are adjusted on the remote.

#### ArcReach SuitCase Feeders For MIG Or FCAW Welding



When welder/generator is associated with Suitcase X-TREME ArcReach feeder, voltage and wire feed settings are adjusted on the feeder.

#### ArcReach Smart Feeder For Advanced Wire Processes



274460-A / 266206-D

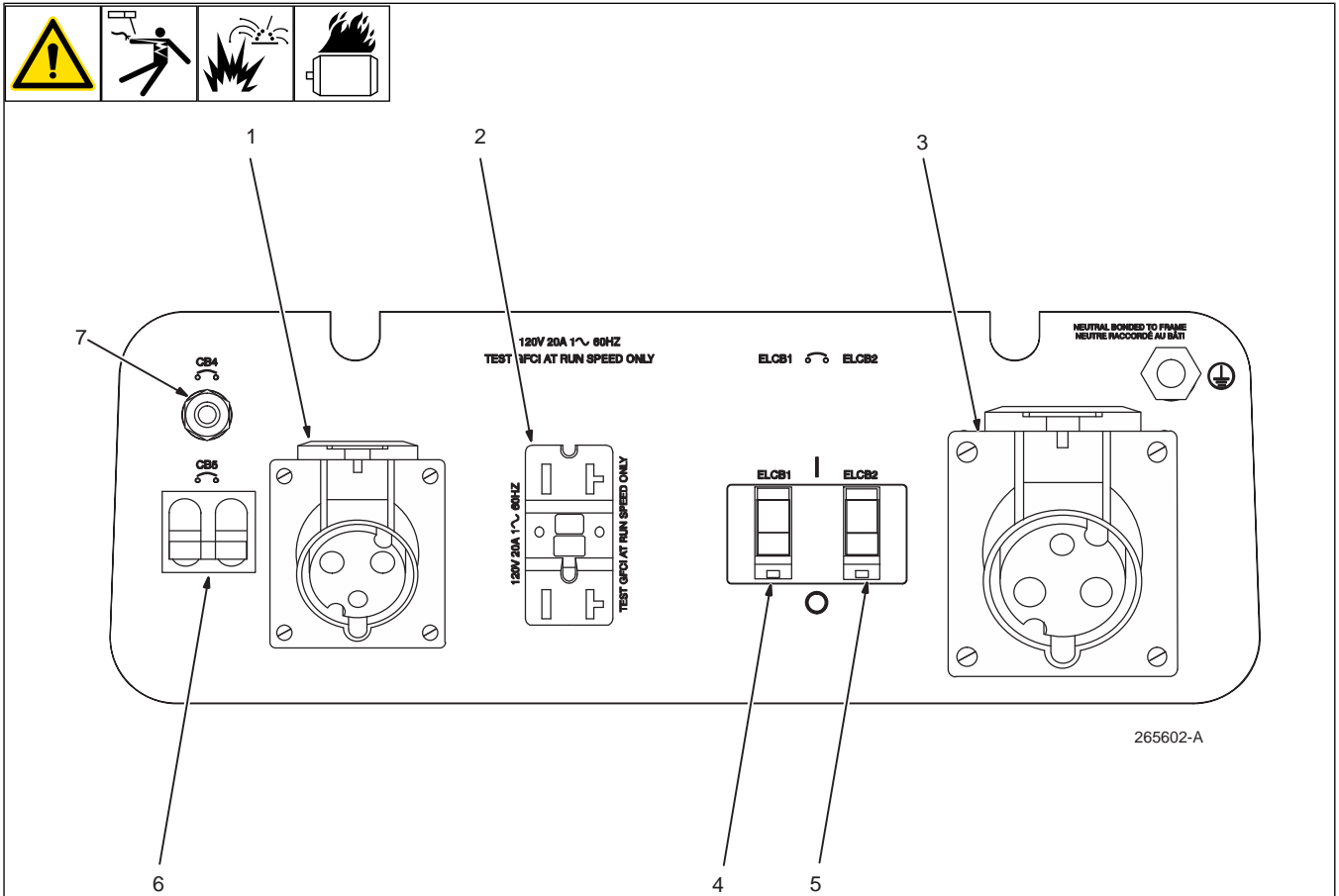
When welder/generator is associated with Smart Feeder, all controls switch to the feeder, and the display reads SMRT ACC.

**⚠** When using an ArcReach device, engine speed is always weld/power speed.



# SECTION 7 – OPERATING AUXILIARY EQUIPMENT

## 7-1. Auxiliary Power Receptacles



**⚠ Use GFCI protection when operating auxiliary equipment. If unit does not have GFCI receptacles, use GFCI-protected extension cord. Do not use GFCI receptacle to power life support equipment.**

**⚠ Unplug power cord before attempting to service accessories or tools.**

- 1 220V 16A AC Receptacle RC11
- 2 110V 20 A AC Receptacle GFCI1
- 3 220V 32 A AC Receptacle RC12

Receptacles supply 50/60 Hz single-phase power.

Maximum combined output of all receptacles is 10 kVa/kW.

- 4 Earth Leakage Circuit Breaker ELCB1

ELCB1 protects receptacle RC11 from overload and earth leakage fault. If circuit breaker opens, the receptacle does not work. Place switch in On position to reset circuit breaker.

- 5 Earth Leakage Circuit Breaker ELCB2

ELCB2 protects receptacle RC12 from overload and earth leakage fault. If circuit breaker opens, the receptacle does not work. Place switch in On position to reset circuit breaker.

- 6 Supplementary Protector CB5

CB5 protects the stator windings from overload. If supplementary protector opens, the receptacles do not work. Reduce load and place in On position.

- 7 Supplementary Protector CB4

CB4 protects GFCI1 from overload. If supplementary protector opens, the receptacle does not work. Press button to reset.

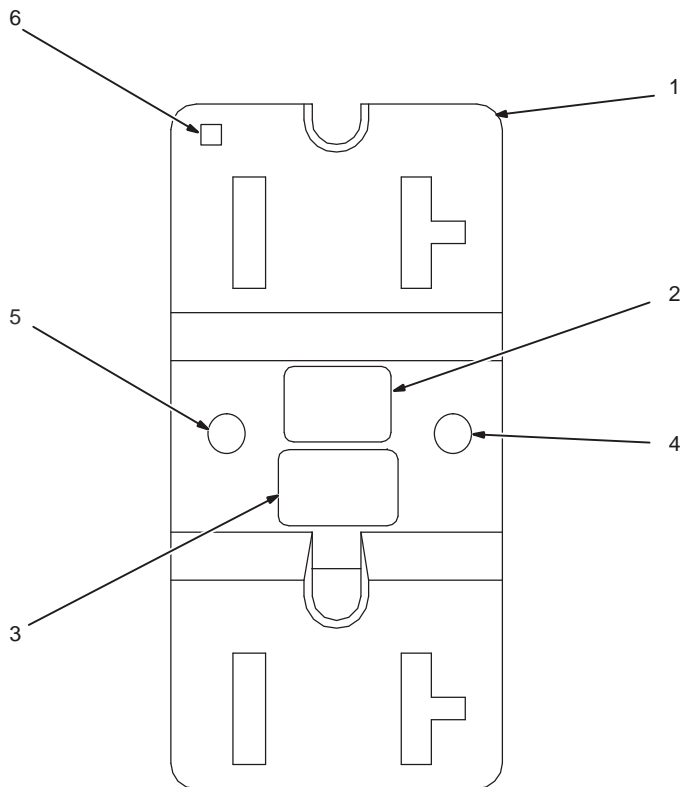
**⚠ Test GFCI monthly. See Section 7-2 for GFCI information and for resetting and testing procedures.**

**☞ At least once a month, run engine at weld/power speed and press test button to verify ELCBs are working properly.**

**☞ If a supplementary protector or circuit breaker continues to open, contact Factory Authorized Service Agent.**

**☞ Generator power decreases as weld output increases.**

## 7-2. GFCI Receptacle Information, Resetting, And Testing



- ⚠ Use GFCI protection when operating auxiliary equipment. If unit does not have GFCI receptacles, use GFCI-protected extension cord. Do not use GFCI receptacle to power life support equipment.**

- ⚠ Unplug power cord before attempting to service accessories or tools.**

- 1 120 V 20 A AC GFCI Receptacle
- 2 GFCI Receptacle Test Button
- 3 GFCI Receptacle Reset Button
- 4 Red GFCI Indicator Light (LED)
- 5 Green GFCI Indicator Light (LED)
- 6 Alternate Location For Red And Green Indicator LEDs

*Red and Green indicator lights may be combined in a single LED.*

*Orientation of receptacle may be different in other applications.*

### GFCI Receptacles

GFCI receptacles protect the user from electric shock if a ground fault occurs in equipment connected to the receptacle. A ground fault occurs when electrical current takes the shortest path to ground (which could be through a person) rather than follow its intended safe path.

If a ground fault is detected, the GFCI Reset button pops out, and the circuit opens to disconnect power to the faulty equipment. A GFCI receptacle does not protect against circuit overloads, short circuits, or shocks not related to ground faults. Reset and test GFCI receptacle according to the following procedures.

A solid green LED indicates power to the GFCI. A solid red LED indicates that the GFCI has been tripped.

### Resetting/Testing GFCI Receptacle

- ⚠ Test GFCI monthly.**
- ⚠ If Red LED blinks, stop using GFCI receptacle and have a Factory Authorized Service Agent replace it.**
- ⚠ Extension cords with bad insulation or of extended length can allow enough leakage current to trip the GFCI circuit. Reset and test as follows.**

### Resetting GFCI Receptacles

If a GFCI fault occurs, stop engine and disconnect equipment from GFCI receptacle. Check for damaged or wet tools, cords, plugs, etc. connected to the receptacle. Start engine, place engine control switch in RUN position, and press GFCI Reset button. Reconnect equipment to GFCI receptacle. If GFCI Reset button pops out again, check the equipment and repair or replace if faulty.

### Testing GFCI Receptacles

Start engine and place engine control switch in Run position. Press the GFCI Test button. The GFCI Reset button should pop out.




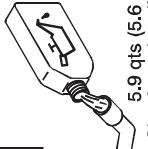



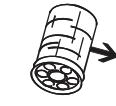

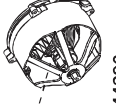



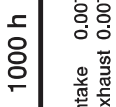
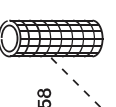
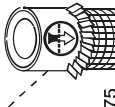
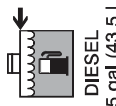
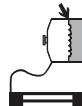


Press the GFCI Reset button.

**Have a Factory Authorized Service Agent replace GFCI if any of the following occur:**

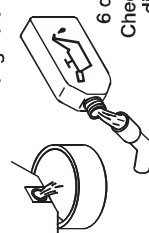


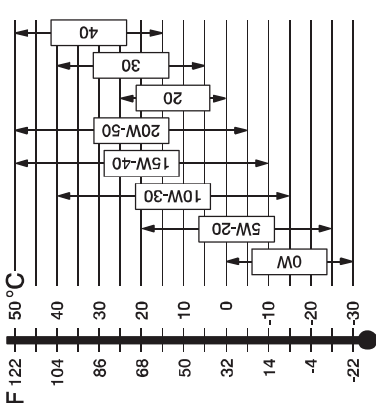





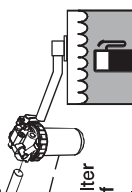


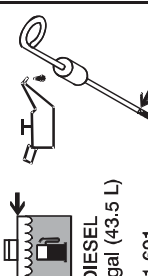
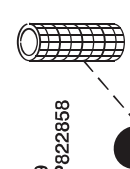
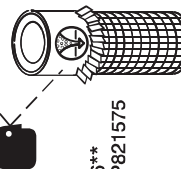
- GFCI does not trip when tested**
- Red LED blinks**
- GFCI does not reset.**

# SECTION 8 – MAINTENANCE AND TROUBLESHOOTING

## 8-1. CAT Maintenance Label

<p><b>CAT C1.5 DIESEL ENGINE</b></p> <p> 12 V BCI 35 or 55 570 A @ 0° F (-18° C)</p> <p> CAT: 172-4585</p> <p> Engine Filter Kit 274427 (Includes Air, Oil and Fuel Filters)</p>		<p>250 h</p> <p> 5.9 qts (5.6 L) Check engine dipstick. For API oil ratings, consult engine owner's manual.</p> <p> MILLER: 202166 CAT: 220-1523</p> <p> 1/2 in (13 mm) MILLER: 217686 CAT: 162-2468</p>		<p>500 h</p> <p> 1. MILLER: 273865 CAT: 243-6411</p> <p> 2. MILLER: 217687 CAT: 150-4142</p> <p> Thermostat CAT: 154-1826</p>		<p>1000 h</p> <p> Brushes MILLER: 244290</p> <p> 6 qts (5.7 L) Turbo only: 7.2 qts (6.8 L)</p>	
		<p>1000 h</p> <p> Intake 0.0078 in (0.2 mm) Exhaust 0.0078 in (0.2 mm)</p> <p> 72° F (20° C)</p>		<p>2000 h</p> <p> 237382-J CAT: 233-0584</p>		<p>100 h</p> <p> MILLER: 197679 Donaldson: P822858</p> <p> MILLER: 197676 Donaldson: P821575</p>	
<p>8 h</p> <p> DIESEL 11.5 gal (43.5 L) DIN 51 601 BS 2869: A1, A2 ASTM D 975-81: 1-D, 2-D VV-F 800C: DF-A, DF-1, DF-2 S &lt; = .5%</p>		<p>100 h</p> <p> </p>		<p>1000 h</p> <p></p>			

## 8-2. Kubota Maintenance Label

<p><b>KUBOTA V1505-E3BG (20.2 HP) DIESEL ENGINE</b></p>		<p>For API ratings, consult engine owner's manual.</p> <p>6 qt (5.7 L) Check engine dipstick.</p> 		<p>250 h std.</p>  <p>OEM 196428** Kubota 16271-32090</p> 		<p>50° C</p> <p>122 104 86 68 50 32 14 -4 -22</p> <p>°F</p> 		<p>1/2 in (13 mm)</p>  <p>OEM 218468 Kubota 16206-97012</p>		<p>Thermostat Kubota 19434-73014</p>  <p>6 qt (5.7 L)</p>		<p>** FILTER KIT 253901 contains noted filters.</p> 	
<p>12 V BCI 35 or 55 585 A @ 0° F (-18° C)</p> 		<p>OEM 187820 Kubota 16851-65512</p> 		<p>500 h std.</p> <p>Clean fuel filter element if required.</p> 		<p>1000 h std.</p> <p>Intake 0.0078 in (0.2 mm) Exhaust 0.0078 in (0.2 mm)</p>  <p>72° F (20° C)</p>		<p>2000 h std.</p>  <p>Kubota 16032-53001</p>		<p>287061-F</p>			
<p>8 h std.</p> <p>DIESEL 11.5 gal (43.5 L)</p> <p>DIN 51 601 BS 2869: A1, A2 ASTM D 975-81: 1-D, 2-D VV-F 800C: DF-A, DF-1, DF-2 S &lt; = .5%</p> 		<p>100 h std.</p> <p>(Optional) OEM 197679 Donaldson P822858</p> 		<p>OEM 197676** Donaldson P821575</p> 									

### 8-3. Routine Maintenance

<p><b>⚠ Stop engine before maintaining.</b></p> <p>👉 See <i>Engine Manual and Maintenance Label</i> for important start-up, service, and storage information. Service engine more often if used in severe conditions.</p> <p>👉 Recycle engine fluids.</p>					
	✓ = Check	◇ = Change	○ = Clean	☆ = Replace	Reference
Every 8 Hours	 ✓ Coolant Level	 ✓ Fuel Level	 ✓ Oil Level	 ○ Oil, Fuel Spills	Engine Manual, Sections 5-8, 5-6, 5-5, 8-9
Every 100 Hours	 ○ Battery and Weld Terminals	 ✓ Air Cleaner Hoses	 ✓ Air Cleaner Element	 ☆ Unreadable Labels	Section 8-4
Every 250 Hours Kubota, CAT <b>NOTICE</b> – Change engine oil and filter after initial 50 to 75 hours of use.		 ◇ Oil and Oil Filter	 ✓ Fan Belt Tension 1/2 in. (13 mm)	 ✓ ○ Spark Arrestor	Engine Manual, Sections 8-6, 8-14
Every 500 Hours	 ✓ Weld Cables	 ✓ Radiator, Thermostat	 ◇ ○ Fuel Filter(s)	 ○ Drain Sludge FUEL SLUDGE	Sections 5-11, 8-2, 8-1, 8-14
Every 1000 Hours	 ✓ ○ Slip Rings* ✓ ☆ Brushes*	 ✓ Valve Clearance*	 ○ Inside Unit	 ✓ Radiator Fluid Level	Engine Manual, Sections 5-8, 8-7
Every 2000 Hours	 ○ Injectors*				

\*To be done by factory authorized service agent.

Kubota Engine America  
 505 Schelter Road  
 Lincolnshire, IL 60069

Phone: 847-955-2500 Fax: 847-955-2699

To find a service facility near you, contact the KEA distributor in your area: <http://www.kubotaengine.com/>

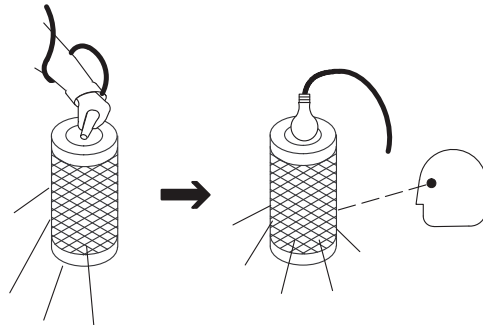
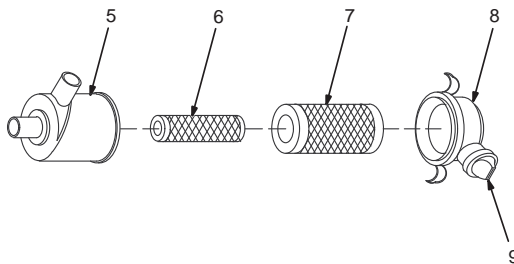
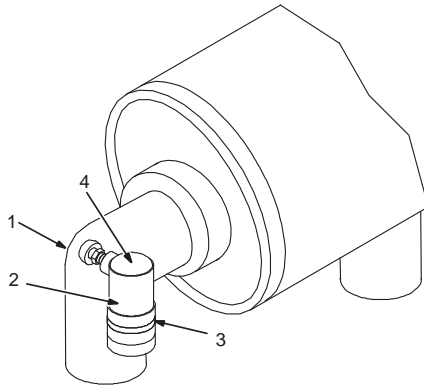
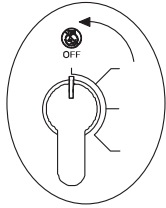
Caterpillar Corporate Headquarters  
 100 North East Adams Street  
 Peoria, IL 61629

309-675-1000

<https://www.cat.com/engines>

Cat Dealer Locator: Use website to find local engine service facility.

## 8-4. Servicing Air Cleaner



**⚠ Stop engine.**

**NOTICE** – Do not run engine without air cleaner or with dirty element. Engine damage caused by using a damaged element is not covered by the warranty.

☞ The air cleaner primary element can be cleaned but the dirt holding capacity of the filter is reduced with each cleaning. The chance of dirt reaching the clean side of the filter while cleaning and the possibility of filter damage makes cleaning a risk. Consider the risk of unwarrantable equipment damage when determining whether to clean or replace the primary element.

**NOTICE** – If you decide to clean the primary element, we strongly recommend installing an optional safety element to provide additional engine protection. **Never clean a safety element.** Replace the safety element after servicing the primary element three times.

- 1 Intake Manifold
- 2 Service Indicator (Optional, Customer Supplied)
- 3 Service Indicator Window
- 4 Service Indicator Reset Button

Service air cleaner element if red band appears in window. A green band means air cleaner is okay. Press button to reset indicator.

Clean or replace primary element if dirty (see note above before cleaning). Replace primary element if damaged. Replace primary element yearly or after six cleanings.

- 5 Housing
- 6 Safety Element (Optional)
- 7 Primary Element
- 8 Cover
- 9 Dust Ejector

**To clean air filter**

Wipe off cover and housing. Remove cover and dump out dust. Remove element (s). Wipe dust from inside cover and housing with damp cloth. Reinstall safety element (if present). Reinstall cover.

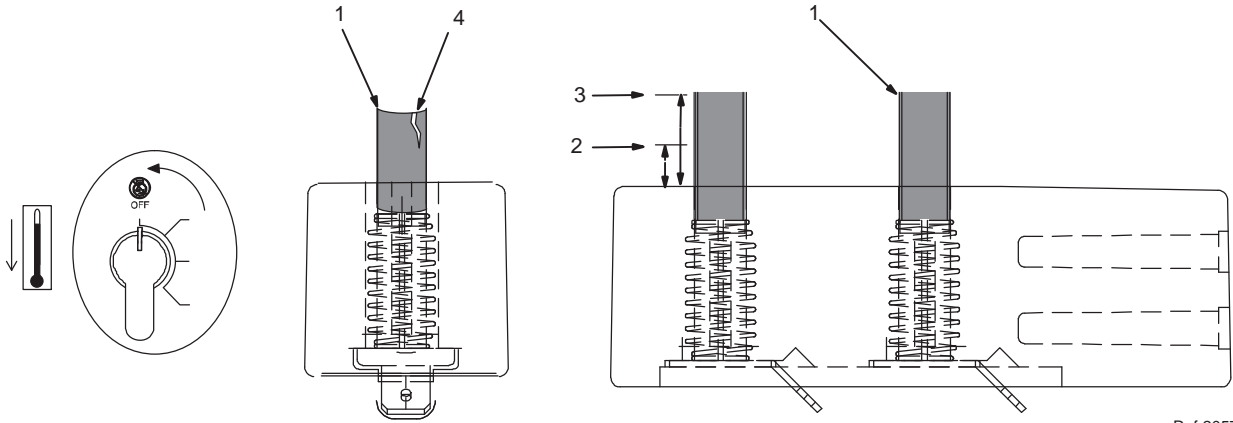
**⚠ Do not clean housing with air hose.**

Clean primary element with compressed air only.

Air pressure must not exceed 100 psi (690 kPa). Use 1/8 in (3 mm) nozzle and keep nozzle at least 2 in (51 mm) from inside of element. Replace primary element if it has holes or damaged gaskets.

Reinstall primary element and cover (dust ejector down).

## 8-5. Checking Generator Brush Assembly



Ref 205725

**⚠ Stop engine and let cool.**

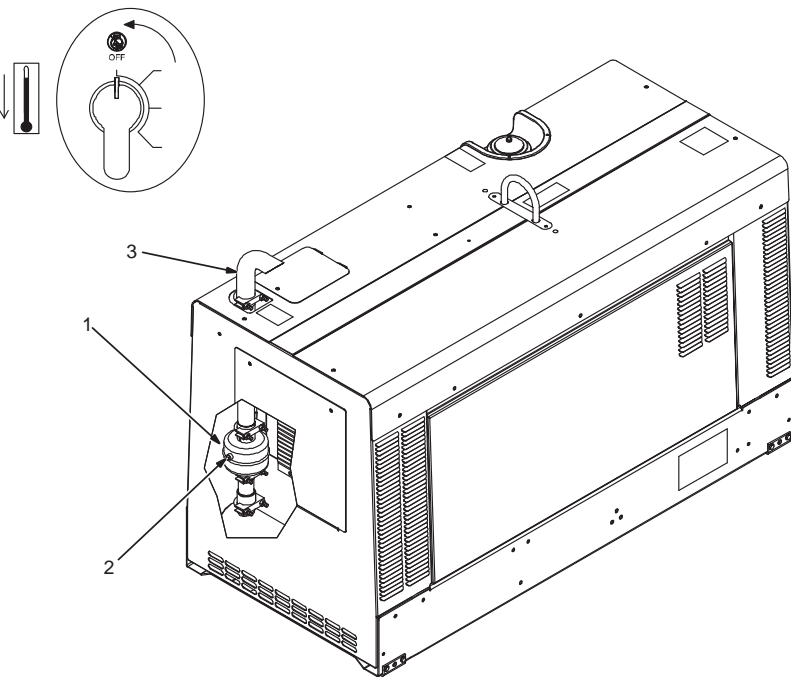
- 1 Generator Brush Assembly
- 2 Minimum Length: 1/4 in. (6.5 mm)
- 3 New Length: 5/8 in. (16 mm)

4 Damaged Brush

Mark and disconnect leads at brushholder assembly. Remove assembly. Press on brush to be sure springs compress.

Replace assembly if brushes are damaged or if brush material is at or near minimum length. Check length from brushholder surface.

## 8-6. Inspecting And Cleaning Optional Spark Arrestor Muffler



3/8 in.

**⚠ Stop engine and let cool.**

- 1 Spark Arrestor Muffler
- 2 Cleanout Plug

Remove plug and remove any dirt covering cleanout hole.

- 3 Exhaust Pipe

Start engine and run at idle speed to blow out cleanout hole. If nothing blows out of hole, briefly cover end of exhaust pipe with fireproof material.

**⚠ Stop engine and let cool.**

Reinstall cleanout plug.

## 8-7. Servicing Engine Cooling System



1 Radiator Cap Cover  
2 Radiator Draincock  
3 Coolant Recovery Tank

Change coolant according to engine manual. Add coolant according to engine maintenance label.

Check coolant level in recovery tank daily. If necessary, add coolant to recovery tank until coolant level is between Cold Full and Hot Full levels. If recovery tank coolant level was low, also check coolant level in radiator when cold. Add coolant if level is below bottom of radiator filler neck.

The diagram shows a cutaway view of the engine compartment. A radiator is visible in the center. To its right is a coolant recovery tank. A draincock is located on the radiator. A cap cover is on top of the radiator. A temperature gauge is shown on the left, and a control knob with an 'OFF' position is also shown. Arrows point from the numbered callouts to the corresponding parts in the diagram.

## 8-8. Battery Maintenance

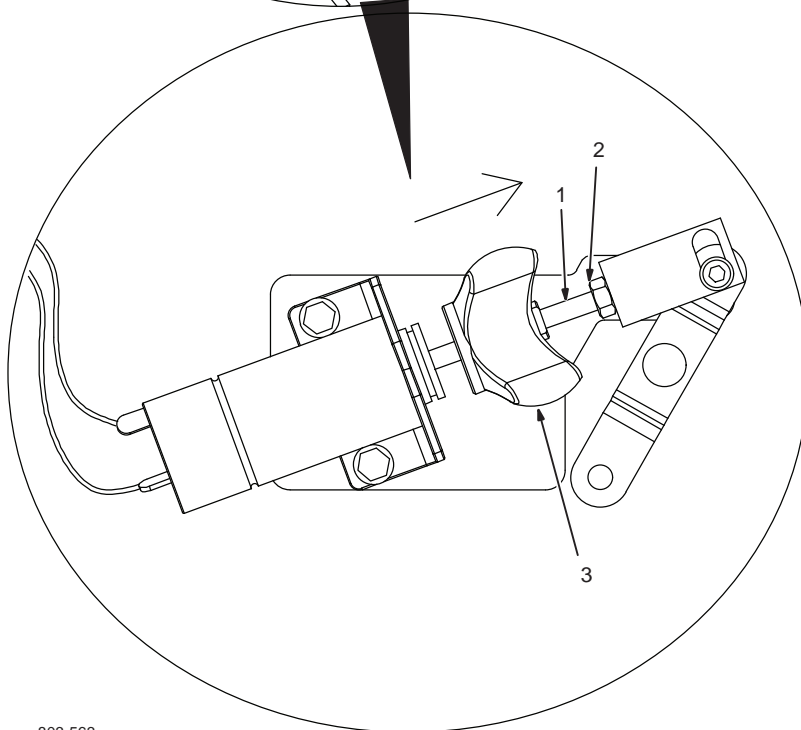
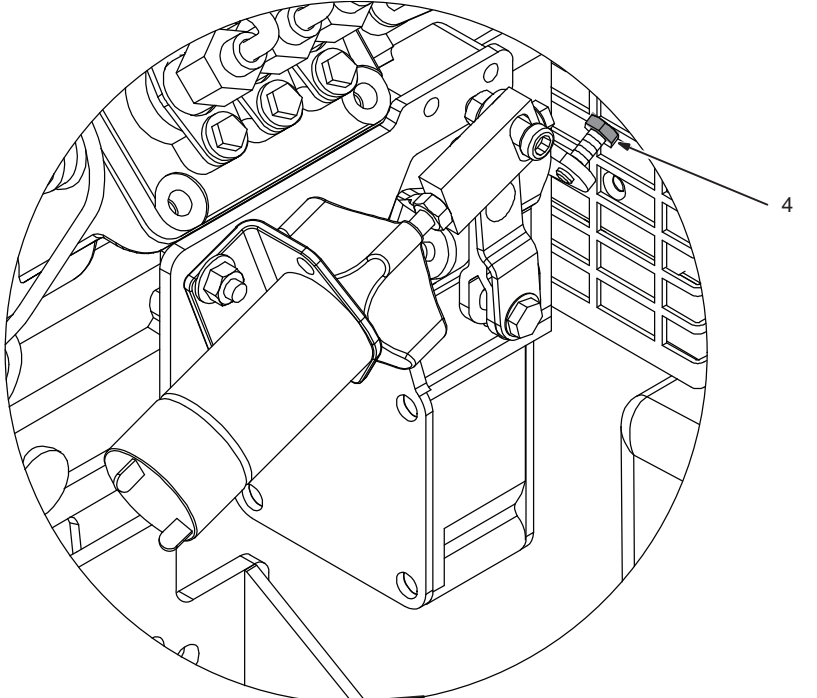
Lead acid batteries discharge when stored in any temperature. Units that are stored should have the battery recharged every three months and before being put into service. To preserve optimum battery performance and life, recharge battery in storage when the open-circuit voltage drops to 12.4 volts DC when measured across the battery terminals.

## 8-9. Maintaining Stainless Steel (Models With Optional Package)

Stainless steel is very resistant to rust and corrosion; however, it must be kept clean to ensure rust and corrosion resistance. Units used in corrosive environments (chlorine or salt water environment for example) should be cleaned with mild soap and water frequently. If dirt buildup occurs, use a stainless steel cleaner to remove buildup. With proper maintenance, stainless steel maintains its luster and appearance.



## 8-10. CAT Engine Speed Adjustment



803 563

**⚠ Stop engine and let cool.**

### Engine Speed Adjustment

After tuning engine, check engine speed with tachometer or frequency meter. See table for proper no load speed. If necessary, adjust speed as follows:

**NOTICE** – Start engine and run until warm. Maximum no load speed must be set with engine warmed up.

Turn Process/Contactor switch to Stick - Weld Terminals Always On position.

- 1 Throttle Rod / Plunger
- 2 Lock Nut
- 3 Rubber Boot
- 4 Adjustment Screw

Adjustment screw is not used to adjust engine speed when automatic idle option is installed.

*☞ To prevent solenoid damage, be sure a 1/8 in. (3 mm) gap exists between the engine low speed screw and throttle lever when the solenoid is held in the energized position.*

Unhook rubber boot from the solenoid housing but leave connected to plunger.

Loosen lock nut. Place Engine Control Switch in Auto position.

Turn throttle rod and plunger until engine runs at idle speed. Tighten lock nut.




Hook rubber boot back onto solenoid housing.

*☞ Be sure solenoid plunger pulls all the way in ("bottoms") when energized.*

### Weld/Power Speed Adjustment

*☞ Weld/power speed adjustment must be done by the engine manufacturer's factory authorized service agent. Tampering with adjustments other than shown may affect engine warranty.*

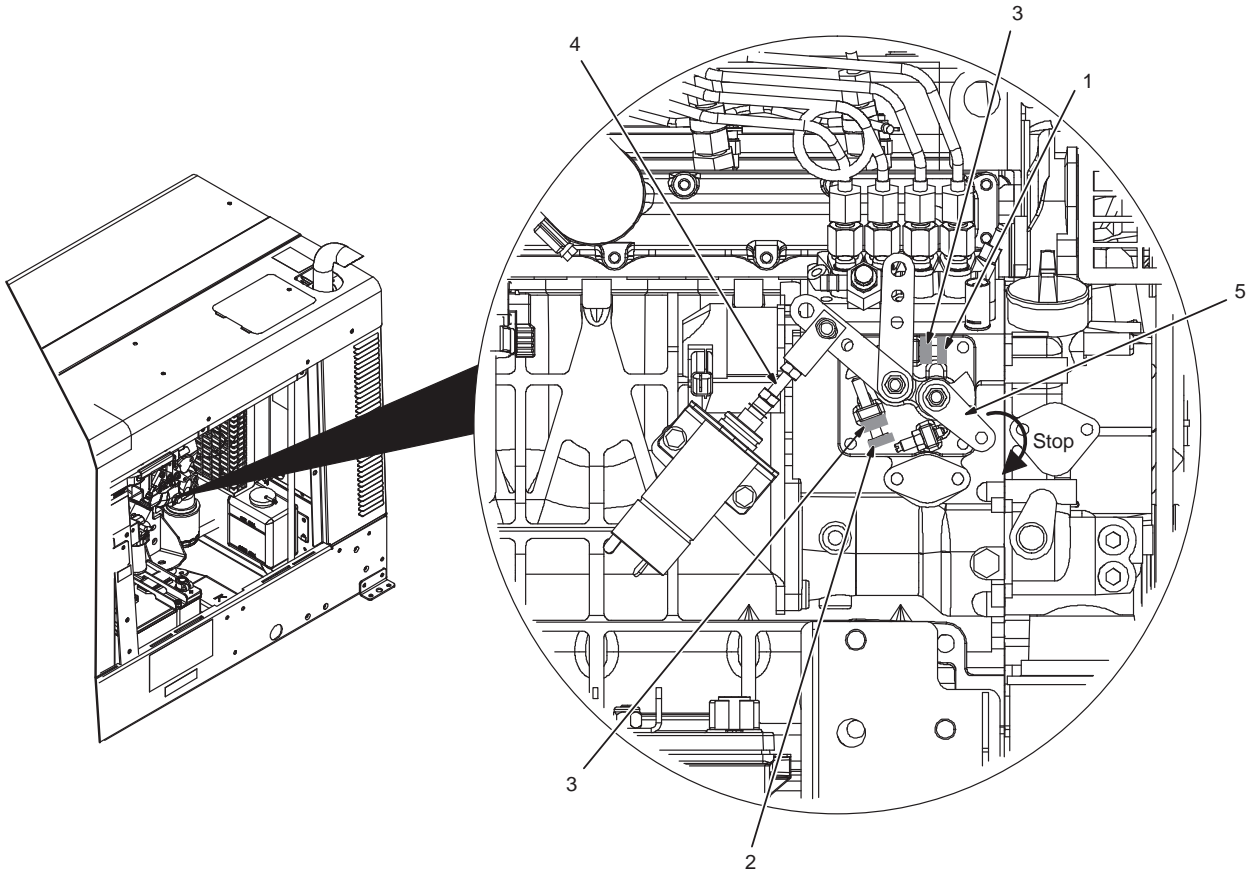
**⚠ Stop engine.**

 Engine Speed (No Load)	
	1890 RPM Max (63 Hz)
	1500 RPM (50 Hz)

## 8-11. CAT Turbo Engine Speed Adjustment

**NOTICE** – Engine speed is not adjustable. Attempting engine speed adjustment may affect warranty.

## 8-12. Kubota Engine Speed Adjustment



**⚠ Stop engine and let cool.**

Engine speed is factory set and should not require adjustment. After tuning engine, check engine speed with tachometer or frequency meter. See table for proper no load speed. If necessary, adjust speed as follows:

Start engine and run until warm.

Turn Process/Contactor switch to Stick - Weld Terminals Always On position.

- 1 High Speed Adjustment Screw
- 2 Low Speed Adjustment Screw
- 3 Lock Nut
- 4 Throttle Solenoid Rod

Loosen nut. Turn high speed adjustment screw until engine runs at weld/power speed. Tighten nut.

Low speed adjustment screw is not used to adjust engine speed when automatic idle option is installed. To prevent solenoid damage, be sure a 1/8 in. (3 mm) gap exists between the engine low speed screw and the throttle lever when the solenoid is held in the energized position.

Adjust length of the throttle solenoid rod until engine runs at idle speed.




*Do not set engine speed higher than specified.*

- 5 Engine Stop Lever

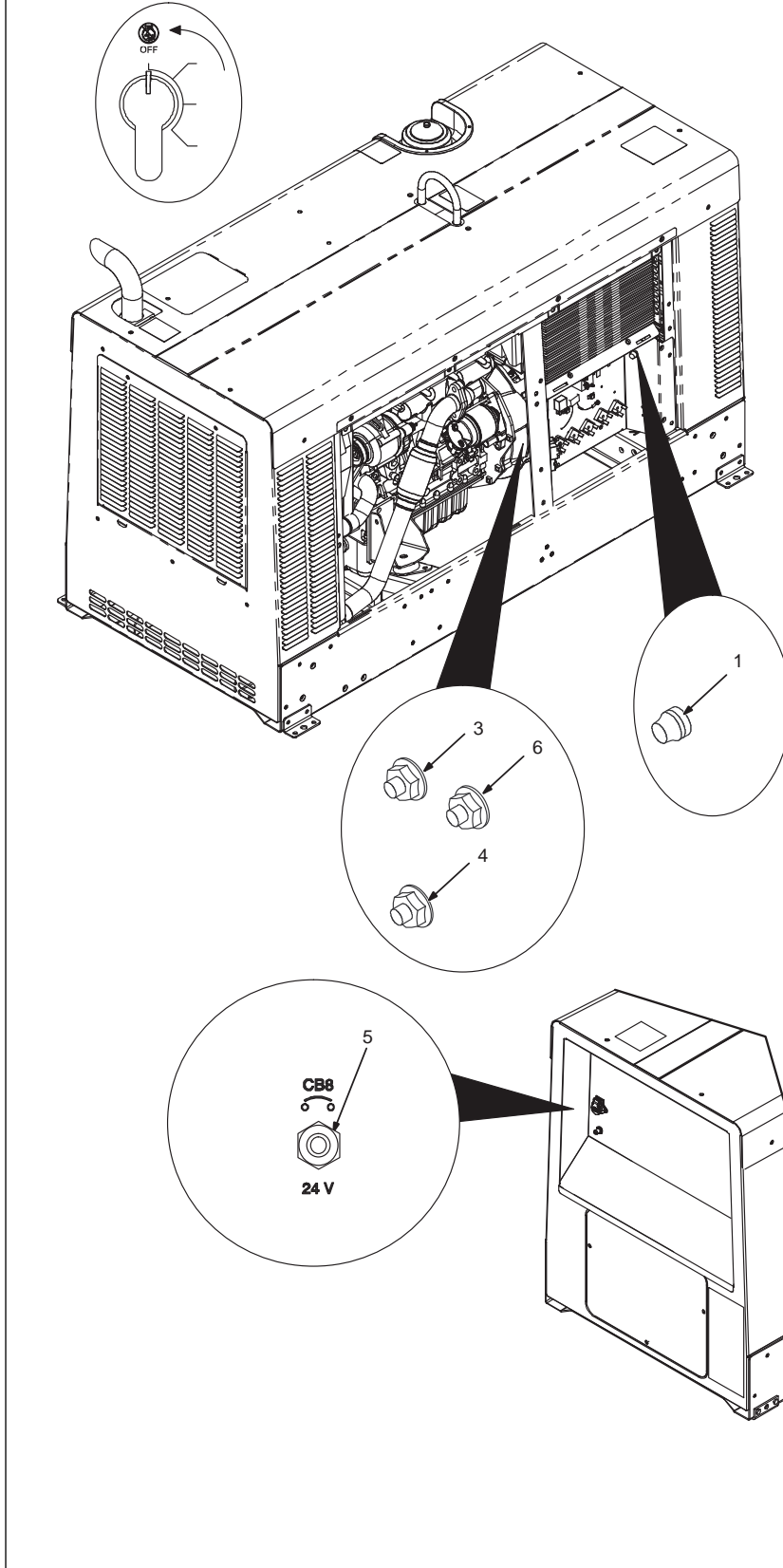
Use lever to stop engine.

**⚠ Stop engine.**


Close door.

	Engine Speed (No Load)
	1890 RPM max (63 Hz)
	1500 RPM (50 Hz)

## 8-13. Overload Protection



### Stop engine.

 When a circuit breaker, supplementary protector, or fuse opens, it usually indicates a more serious problem exists. Contact Factory Authorized Service Agent.

#### 1 Fuse F1

F1 protects the stator exciter winding from overload. If F1 opens, weld and generator power is low or stops entirely.

#### 2 Circuit Breaker CB1 (Not Shown)

#### 3 Supplementary Protector CB2

#### 4 Supplementary Protector CB3

#### 5 Supplementary Protector CB8

#### 6 Circuit Breaker CB9 (Kubota Engine Models)

CB1 protects the engine battery circuit. If CB1 opens, the engine will not crank. CB1 automatically resets when the fault is corrected.

CB2 protects the engine wiring harness. If CB2 opens, the engine will not crank.

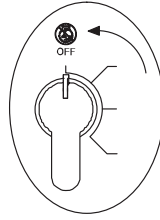
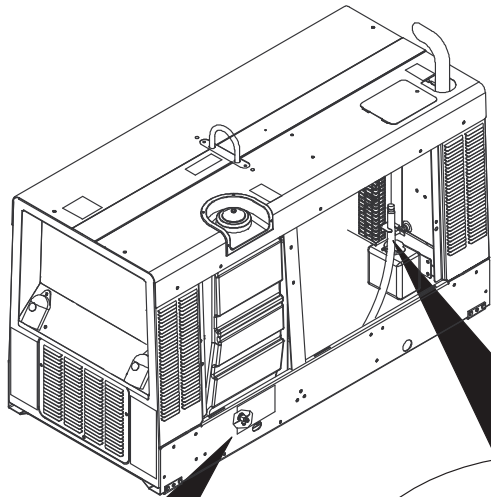
CB3 protects part of the weld control wiring harness. If CB3 opens, weld and generator power output stops.

CB8 protects the 24 volt AC output to remote receptacle RC14. If CB8 opens, 24 volt output to RC14 stops.

Press button to reset supplementary protector.

CB9 protects the throttle solenoid against overload. If CB9 opens, the engine does not automatically idle down. Check the linkage and solenoid. CB9 automatically resets.

## 8-14. Servicing Fuel And Lubrication Systems



**⚠ Stop engine and let cool.**

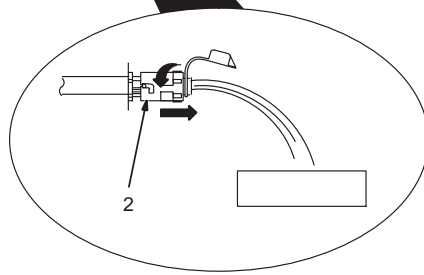
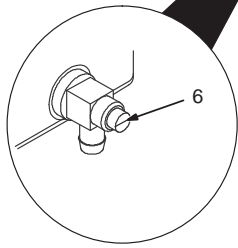
**⚠ After servicing, start engine and check for fuel leaks. Stop engine, tighten connections as necessary, and wipe up spilled fuel.**

- 1 Oil Filter
- 2 Oil Drain Valve And Hose
- 3 Oil Fill Cap
- 4 Primary Fuel Filter
- 5 Secondary Fuel Filter
- 6 Fuel Tank Sludge Drain Valve
- 7 Fuel Filter Clamps

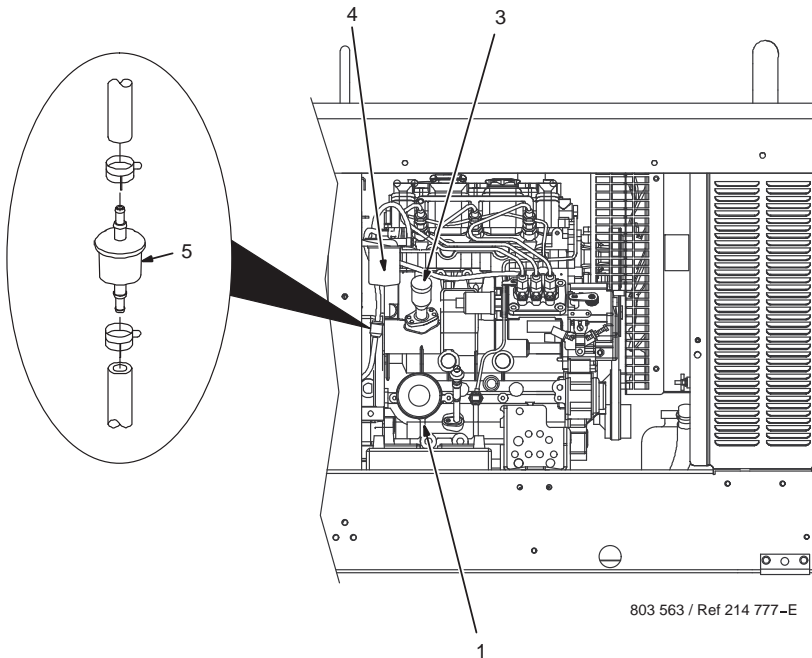
### To change oil and filter:

Route oil drain hose and valve through hole in base. See engine manual and engine maintenance label for oil/filter change information.

*See Section 6-4 to reset the oil change hours following service.*

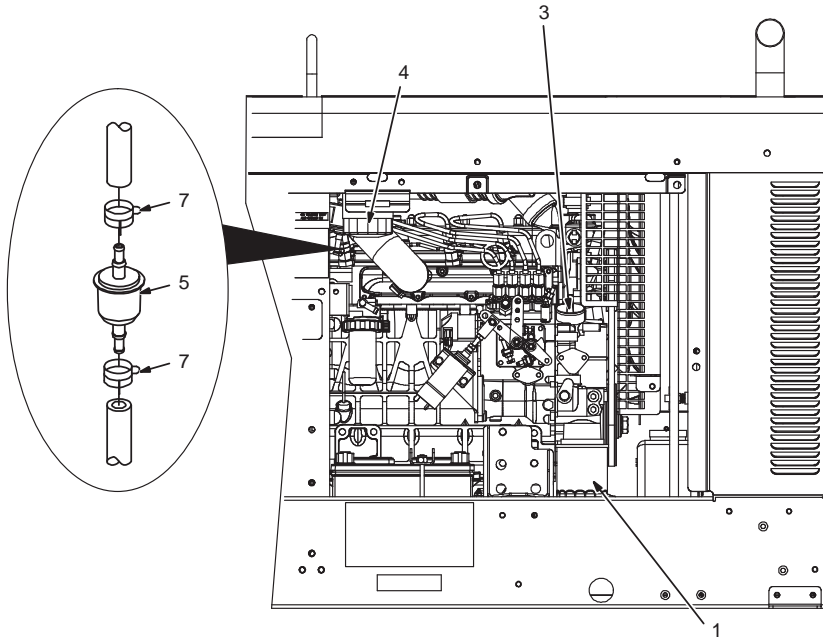


### CAT Engine



803 563 / Ref 214 777-E

### Kubota Engine



#### To replace primary fuel filter:

Turn filter counterclockwise. Remove filter.

Fill new filter with fresh fuel. Apply thin coat of fuel to gasket on new filter.

Install new filter and turn clockwise.

Bleed air from fuel system according to engine manual.

Inspect fuel lines, and replace if cracked or worn.

#### To drain water from fuel system:

See engine manual.

#### To replace secondary fuel filter:

Note direction of fuel flow as indicated by arrow on side of filter. Remove fuel line clamps and disconnect fuel lines from fuel filter. Replace filter, reconnect fuel lines, and reinstall clamps.

#### To drain sludge from fuel tank:

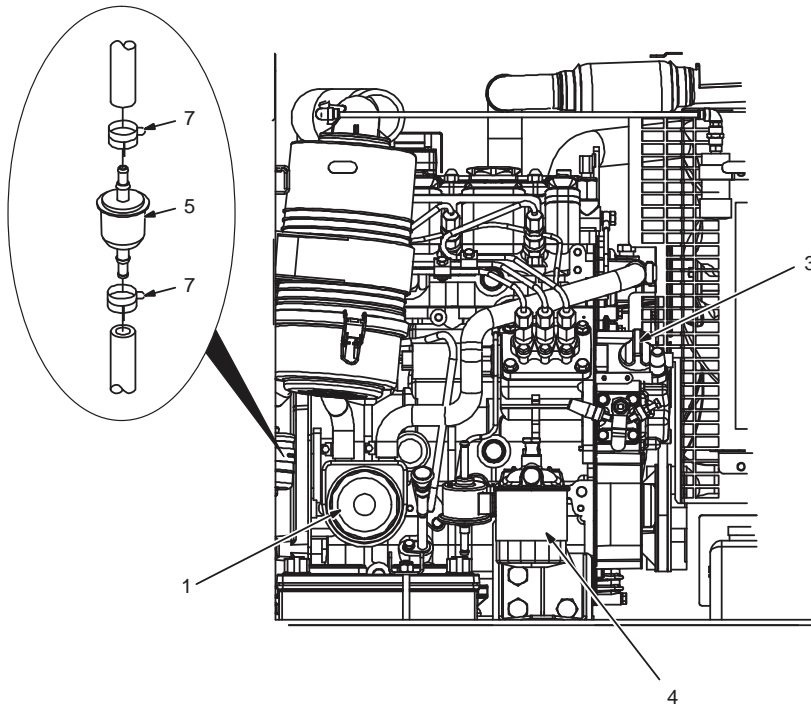
**⚠ Beware of fire. Do not smoke and keep sparks and flames away from drained fuel. Dispose of drained fuel in an environmentally safe manner. Do not leave unit unattended while draining fuel tank.**

**⚠ Properly lift unit and secure in a level position. Use adequate blocks or stands to support unit while draining fuel tank.**

Attach 1/2 ID hose to drain valve. Put metal container under drain, and use screwdriver to open sludge drain valve. Close valve when sludge has drained. Remove hose.

Close door.

### CAT Turbo Engine



## 8-15. Voltmeter/Ammeter Error Displays



Use the Voltmeter/Ammeter error displays to diagnose and correct fault conditions.

☞ When an error is displayed, normally weld output has stopped but generator power output may be okay.

☞ To reset error displays, stop unit and then restart. See below to reset CHEK REMT display.

Error Display	Description
CHEK REMT	Indicates a remote device connected to the Remote Receptacle may be faulty. Clear fault by stopping and restarting the unit, or by turning Process/Contactor switch to another position. If problem continues, have Factory Authorized Service agent check the remote device and main control board PC1.
IGBT 1SHT	Indicates the thermistor in IGBT module 1 has shorted. Have Factory Authorized Service Agent check unit.
IGBT 1OPN	Indicates the thermistor in IGBT module 1 is open. Have Factory Authorized Service Agent check unit.
IGBT 2SHT	Indicates the thermistor in IGBT module 2 has shorted. Have Factory Authorized Service Agent check unit.
IGBT 2OPN	Indicates the thermistor in IGBT module 2 is open. Have Factory Authorized Service Agent check unit.
IGBT TEMP	Indicates an IGBT module has overheated. If this display is shown, check generator cooling system and/or reduce duty cycle. Keep engine access door closed when running unit to maintain proper cooling airflow past module. Allow unit to cool before restarting. If problem continues, have Factory Authorized Service Agent check unit.
MAX POWR	Engine power limit exceeded, causing weld output to be temporarily reduced. Error clears after 5 seconds.
S/W ERR	Software version mismatch occurred. Reload software update. If error does not clear, have Factory Authorized Service Agent check unit.
S/W BLD	Software build mismatch occurred. Reload software update. If error does not clear, have Factory Authorized Service Agent check unit.
BOOT ERR	Slave processor(s) not reporting versions. Reload software.

## 8-16. Troubleshooting Tables



Also see Voltmeter/Ammeter help displays to assist in troubleshooting weld problems (see Section 8-15).

### A. Welding

Trouble	Remedy
No weld output; generator power output okay at AC receptacles.	Place Process/Contactor switch in a Weld Terminals Always On position, or place switch in a Remote On/Off Switch Required position and turn remote contactor on (see Section 5-12).
	Reset supplementary protector CB8 (see Section 8-13). Check for faulty remote device connected to Remote receptacle.
	Check and secure connections to Remote receptacle (see Section 5-12).
	Check Voltmeter/Ammeter error displays (see Section 8-15).
No weld output, or generator power output at AC receptacles.	Disconnect equipment from generator power receptacles during start-up.
	Reset supplementary protector CB3. (see Section 8-13).
	Check fuse F1, and replace if open (see Section 8-13). If F1 is open, have Factory Authorized Service Agent check the field excitation circuit.
	Check Voltmeter/Ammeter error displays (see Section 8-15).
Erratic weld output.	Have Factory Authorized Service Agent check brushes and slip rings and field excitation circuit.
	Check and tighten connections inside and outside unit.
	Be sure connection to work piece is clean and tight.
	Use dry, properly stored electrodes.
	Remove excessive coils from weld cables.
High weld output.	Have Factory Authorized Service Agent check brushes and slip rings.
	Have Factory Authorized Service Agent check main control module PC1 and hall device HD1.
Low weld output.	Check engine speed, and adjust if necessary.
	Check fuse F1, and replace if open (see Section 8-13). If F1 is open, have Factory Authorized Service Agent check the field excitation circuit.
Low open-circuit voltage.	Check engine speed, and adjust if necessary.
	Have Factory Authorized Service Agent check main control module PC1, field excitation circuit, and main rectifier.
No remote fine amperage control.	Repair or replace remote control device.
	Check and secure connections to Remote receptacle (see Section 5-12).
No 24 volt AC output at Remote receptacle.	Reset supplementary protector CB8 (24 volt) (see Section 8-13).

### B. Generator Power

Trouble	Remedy
No generator power output at AC receptacles; weld output okay.	Reset receptacle supplementary protector(s) (see Section 7-1). Check and reset GFCI receptacle if necessary (see Section 7-2).
No generator power or weld output.	Disconnect equipment from generator power receptacles during start-up.
	Check fuse F1, and replace if open (see Section 8-13). Have Factory Authorized Service Agent check field excitation circuit.
	Reset supplementary protector CB3 (see Section 8-13).
	Check Voltmeter/Ammeter error displays (see Section 8-15).
High output at generator power AC receptacles.	Have Factory Authorized Service Agent check brushes and slip rings, and field excitation circuit.
	Have Factory Authorized Service Agent check field excitation circuit.
Low output at generator power AC receptacles.	Check engine speed, and adjust if necessary.
	Check fuse F1, and replace if open (see Section 8-13). If F1 is open, have Factory Authorized Service Agent check the field excitation circuit.

### C. Engine

Trouble	Remedy
Engine will not crank.	Check battery, and replace if necessary.
	Check battery connections and tighten if necessary.
	Circuit breaker CB1 may be open. CB1 automatically resets when fault is corrected (see Section 8-13). Have Factory Authorized Service Agent check engine wiring harness and components.
	Reset supplementary protector CB2 (see Section 8-13).
	Check engine wiring harness plug connections.
	Check Voltmeter/Ammeter error displays (see Section 8-15).
	Have Factory Authorized Service Agent check Engine Control switch S1 and control relay CR2.
Engine cranks but does not start.	Check fuel level.
	Check battery and replace if necessary. Check engine charging system according to engine manual.
	Have Factory Authorized Service Agent check control relay CR1, fuel solenoid FS1, and the fuel pump.
	Air in fuel system. See engine manual.
Engine hard to start in cold weather.	Use Preheat switch (see Section 6-1).
	Keep battery in good condition. Store battery in warm area off cold surface.
	Use fuel formulated for cold weather (diesel fuel can gel in cold weather). Contact local fuel supplier for fuel information.
	Use correct grade oil for cold weather (see Section 8-3). Have Factory Authorized Service Agent check Preheat switch S4, control relay CR3, and the glow plugs.
Engine suddenly stops.	Check oil and coolant levels. Automatic shutdown system stops engine if oil pressure is too low or coolant temperature is too high (see Section 5-7).
	Check Voltmeter/Ammeter error displays (see Section 8-15).
	Circuit breaker CB1 may be open. CB1 automatically resets when fault is corrected (see Section 8-13). Reset supplementary protector CB2 (see Section 8-13). Have Factory Authorized Service Agent check engine alternator, engine harness, fuel solenoid FS1, and the fuel pump.
	Have Factory Authorized Service Agent check Engine Control switch S1, control relay CR1, integrated rectifier SR2, fuel solenoid FS1, and the fuel pump.
	See engine manual.
Engine slowly stopped and cannot be restarted.	Check fuel level.
	Check Voltmeter/Ammeter error displays (see Section 8-15).
	Check engine air and fuel filters (see Sections 8-4 and 8-14).
	See engine manual.
Battery discharges between uses.	Turn Engine Control switch off when unit is not running.
	Clean top of battery with baking soda and water solution; rinse with clear water.
	Recharge or replace battery if necessary.
	Periodically recharge battery (approximately every 3 months).
Engine idles, but does not come up to weld speed.	Have Factory Authorized Service Agent check current transformer CT1 and current transducer HD1.
	Check Voltmeter/Ammeter error displays (see Section 8-15).
Engine does not run at idle speed.	Have Factory Authorized Service Agent check control relay CR4, circuit breaker CB9, and throttle solenoid TS1.
	Check Voltmeter/Ammeter error displays (see Section 8-15).
Engine uses oil during run-in period; wetstacking occurs.	Dry engine according to run-in procedure (see Section 11).



## SECTION 9 – PARTS LIST

### 9-1. Recommended Spare Parts

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
		284184	USB Flash Drive	1
F1		085874	Fuse, Mintr Cer Slo-blo 10. Amp 250 Volt	1
		244290	Brushholder Assembly, Generator w/Leads	1
		218468	Belt, Alternator (Kubota)	1
		233482	Kit, Fuel Sedimenter (Kubota)	1
		253901	Kit, Filter (Kubota) (Includes)	1
		196428	—Filter, Oil	1
		207715	—Filter, Fuel Spin-on	1
		197676	—Element, Air Cleaner	1
		217686	Belt, Alternator (CAT)	1
		274427	Kit, Filter CAT (C1.5) Perkins (403-15)	1
		202166	—Filter, Oil (CAT)	1
		273865	—Filter, Fuel In-line 5/16x5/16 Mic 25	1
		217687	—Filter, Fuel Spin-on (CAT)	1
		197676	—Element, Air Cleaner	1
		◆197679	Element, Air Cleaner Safety	1
			Battery, 12V 570 Crk 100 Rsv Gp 35	1

◆Optional

**To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.**

# SECTION 10 – ELECTRICAL DIAGRAMS

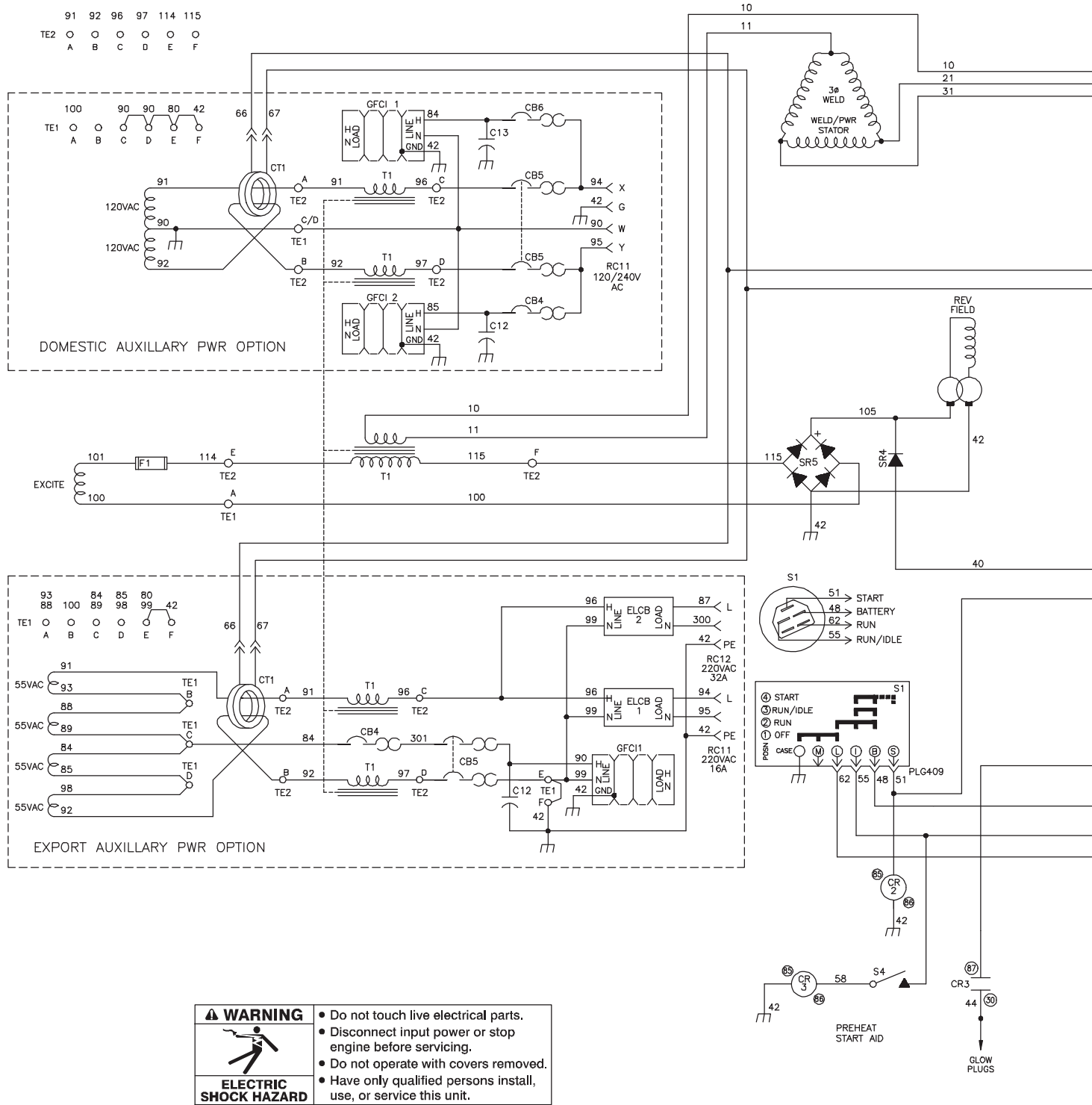
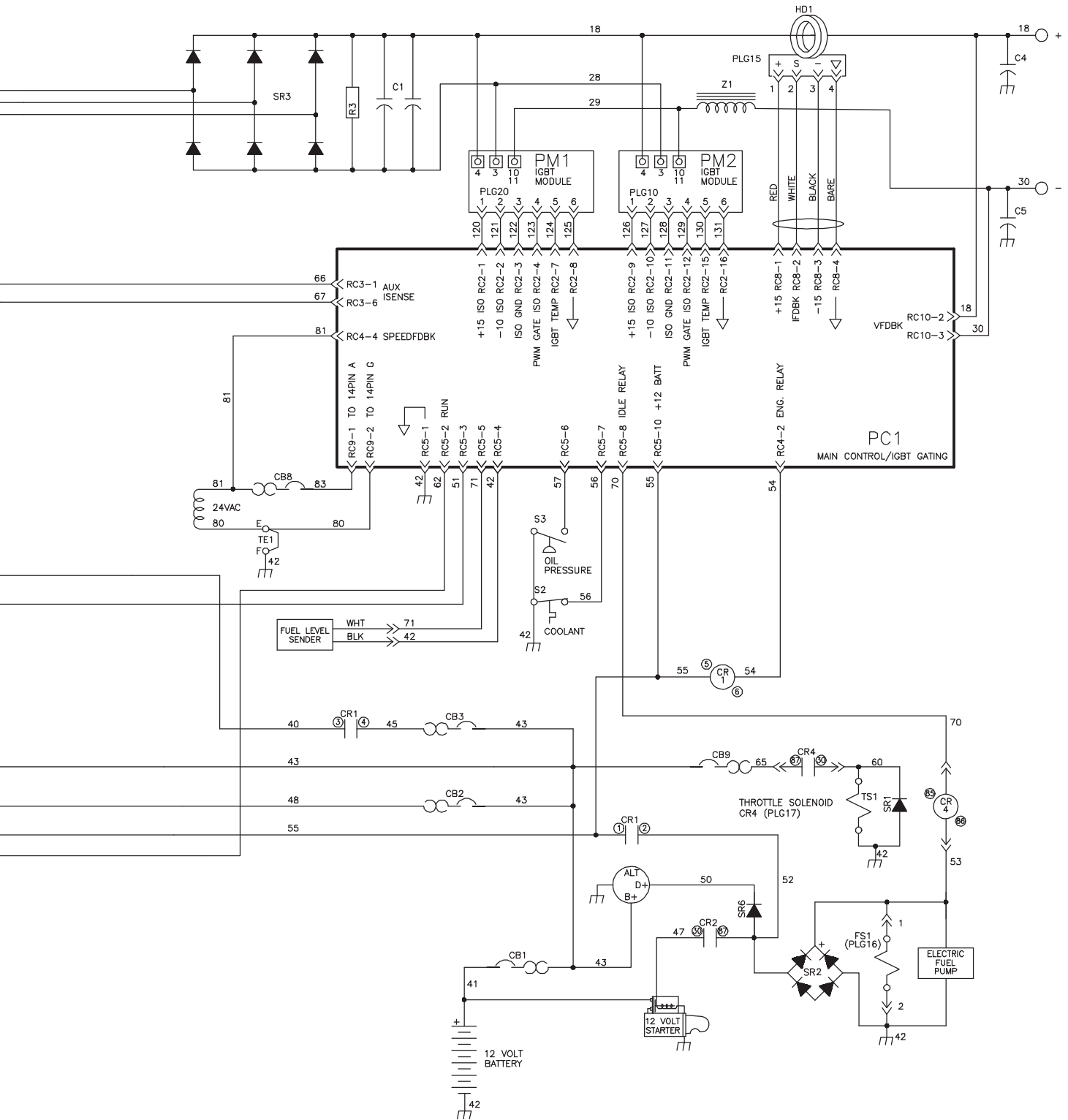
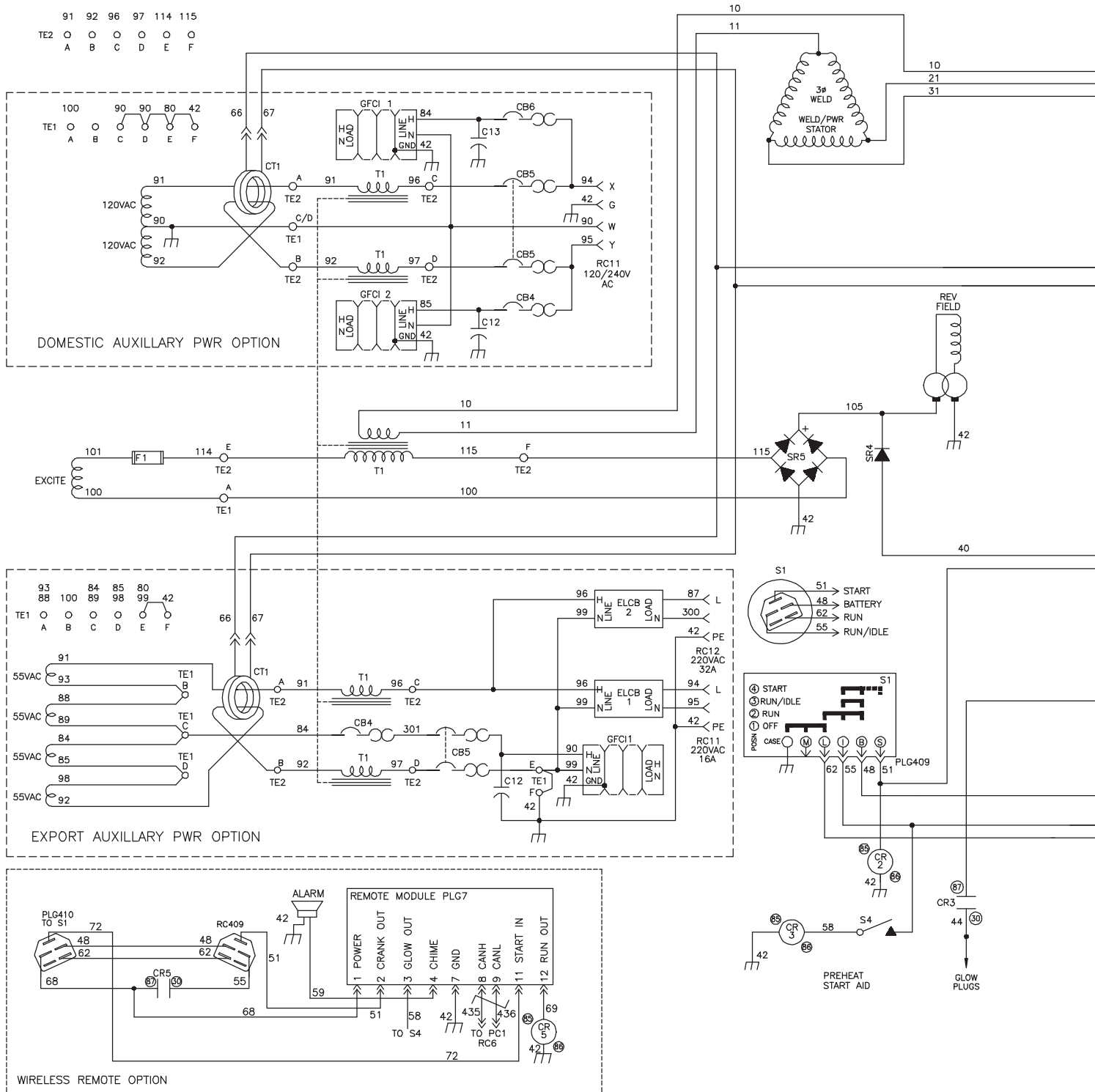


Figure 10-1. Circuit Diagram For Models With CAT Engine



281494-B

91 92 96 97 114 115  
 TE2 ○ ○ ○ ○ ○ ○  
 A B C D E F

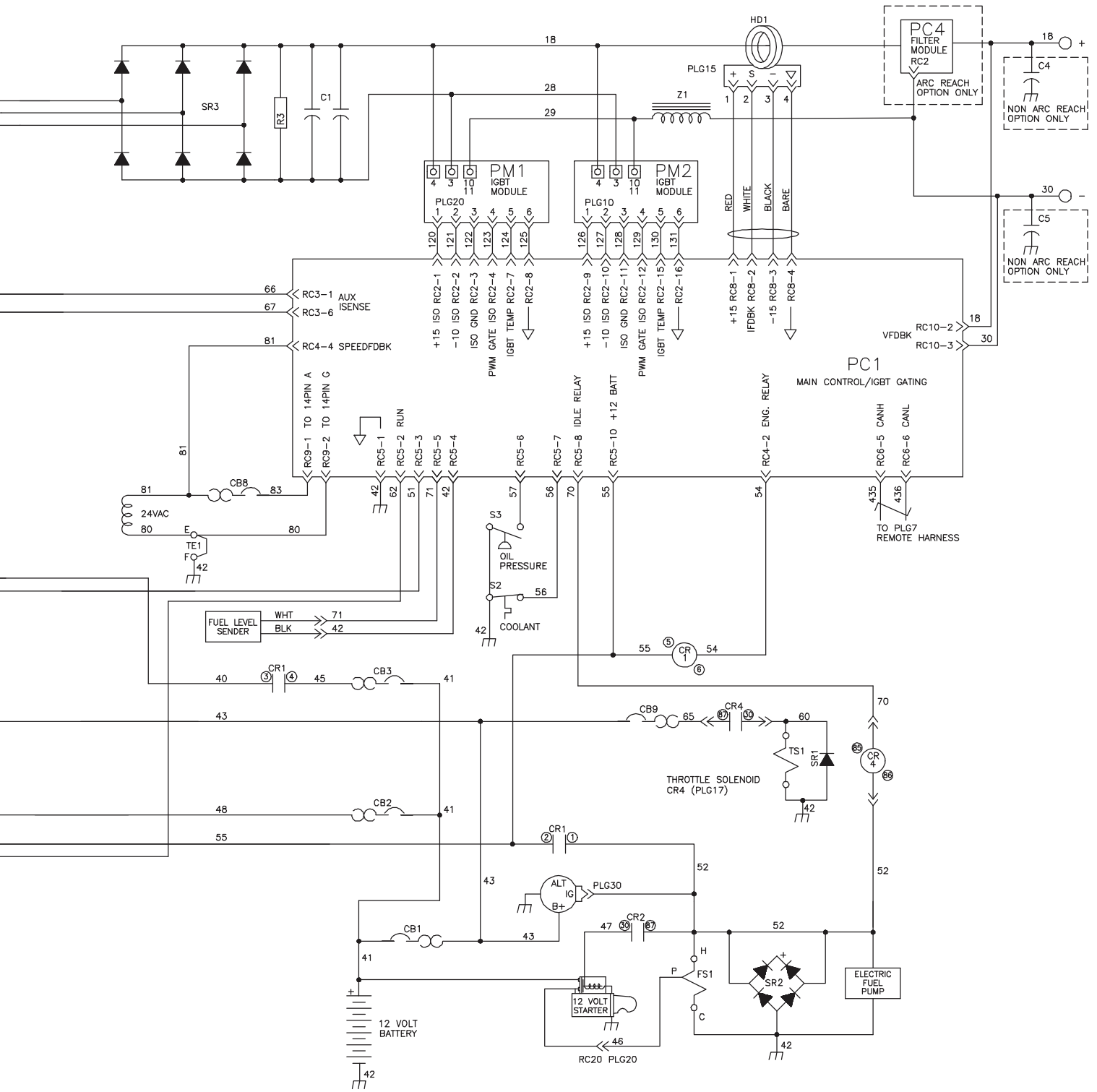


**⚠ WARNING**

- Do not touch live electrical parts.
- Disconnect input power or stop engine before servicing.
- Do not operate with covers removed.
- Have only qualified persons install, use, or service this unit.

**ELECTRIC SHOCK HAZARD**

Figure 10-2. Circuit Diagram For Models With Kubota Engine



288267-A

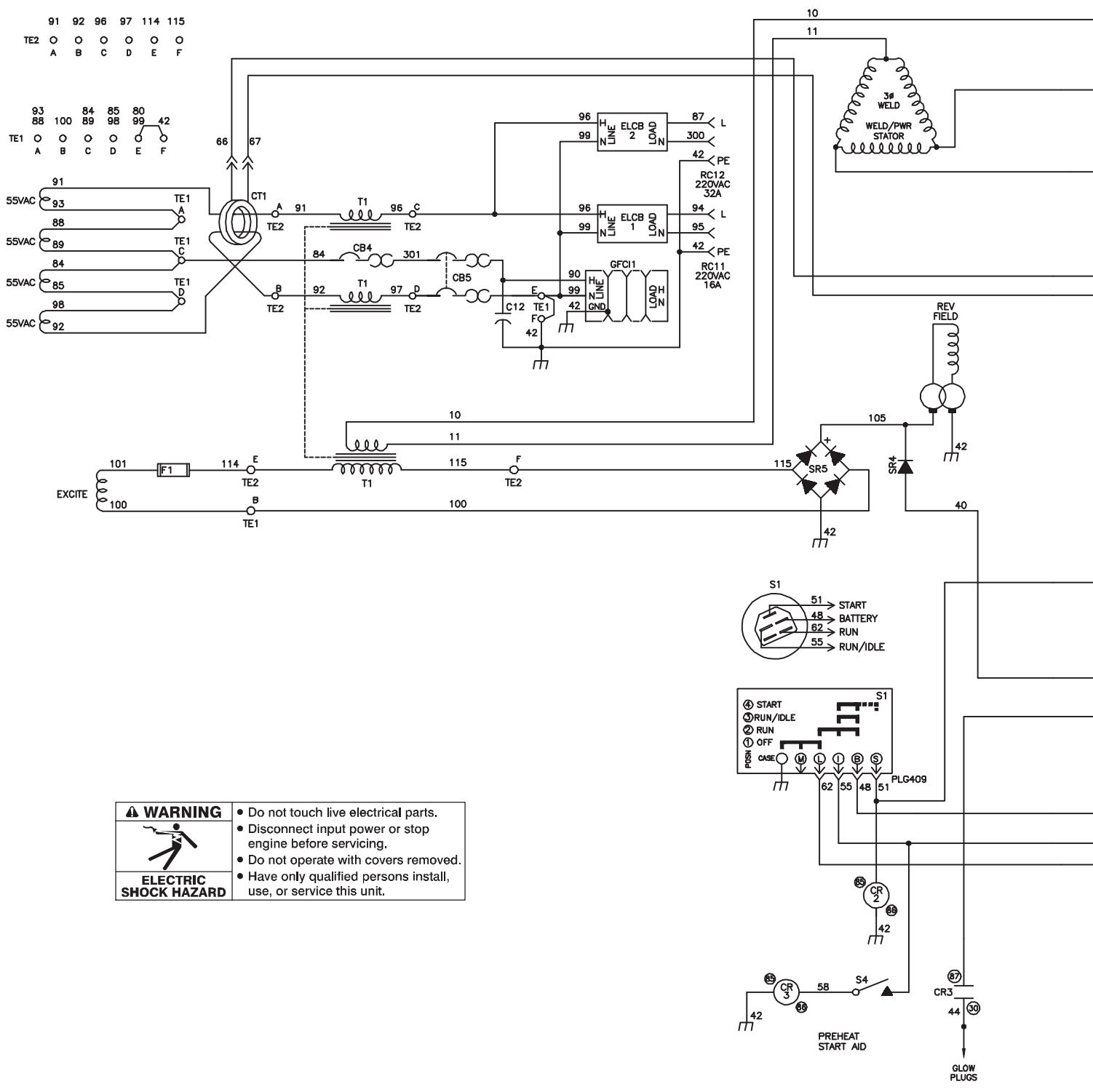
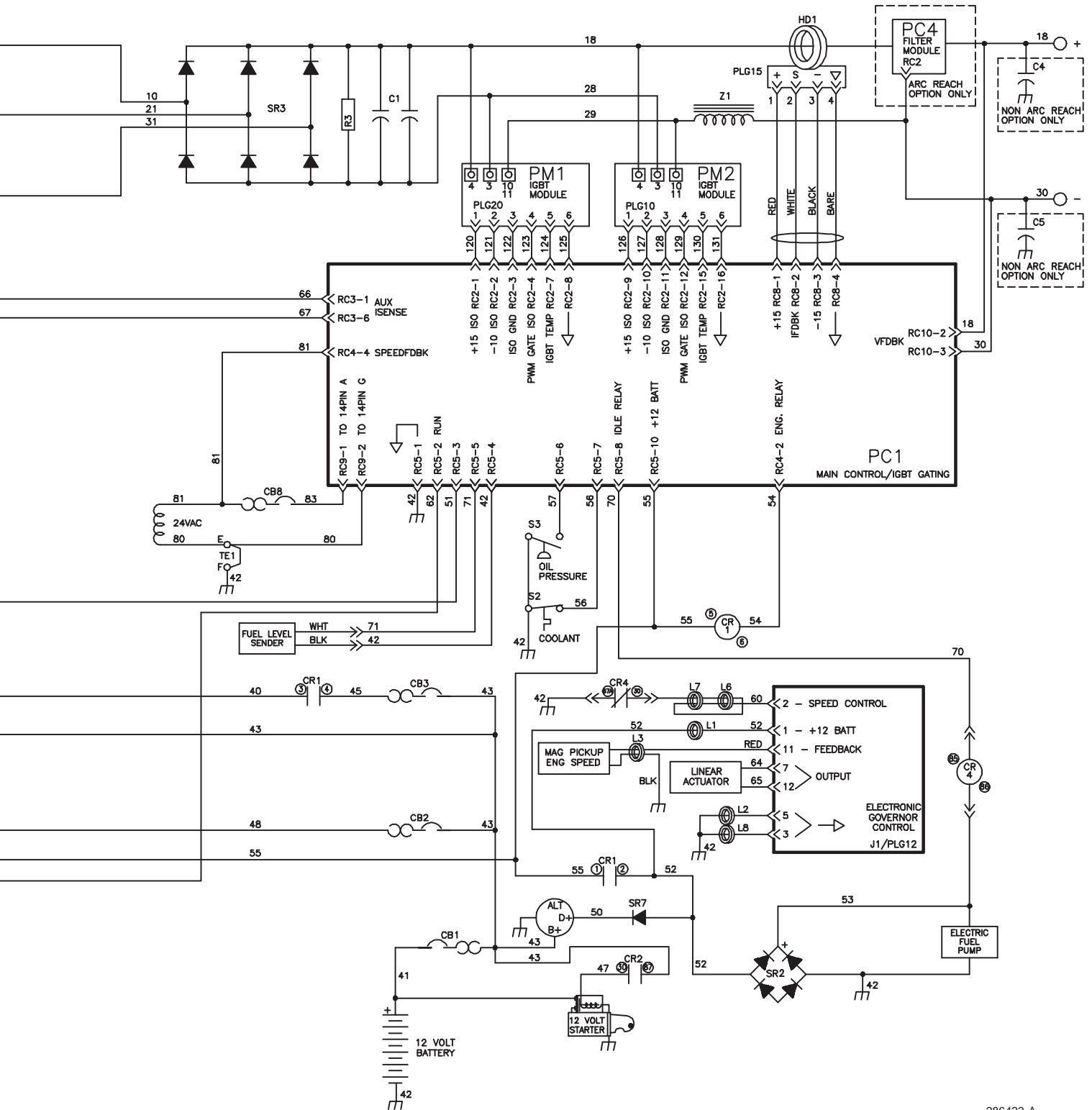


Figure 10-3. Circuit Diagram For Models With CAT Turbo Engine

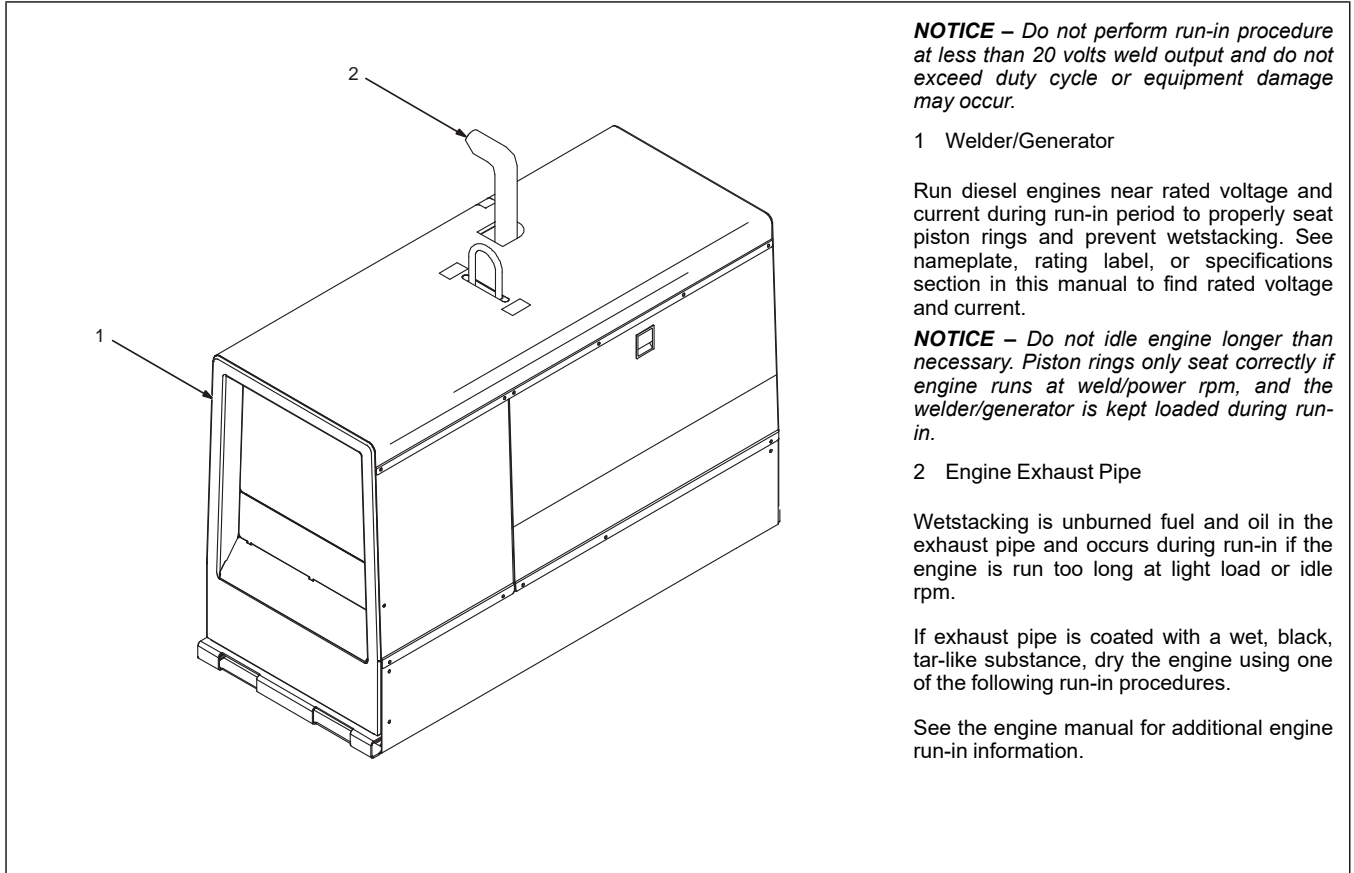


286423-A

# SECTION 11 – RUN-IN PROCEDURE

**NOTICE** – Diesel engines in Miller equipment are meant to operate optimally at moderate to rated load. Using light or no load for extended periods of time may cause wetstacking or other engine damage. Do not idle engine longer than necessary.

## 11-1. Wetstacking



**NOTICE** – Do not perform run-in procedure at less than 20 volts weld output and do not exceed duty cycle or equipment damage may occur.

### 1 Welder/Generator

Run diesel engines near rated voltage and current during run-in period to properly seat piston rings and prevent wetstacking. See nameplate, rating label, or specifications section in this manual to find rated voltage and current.

**NOTICE** – Do not idle engine longer than necessary. Piston rings only seat correctly if engine runs at weld/power rpm, and the welder/generator is kept loaded during run-in.

### 2 Engine Exhaust Pipe

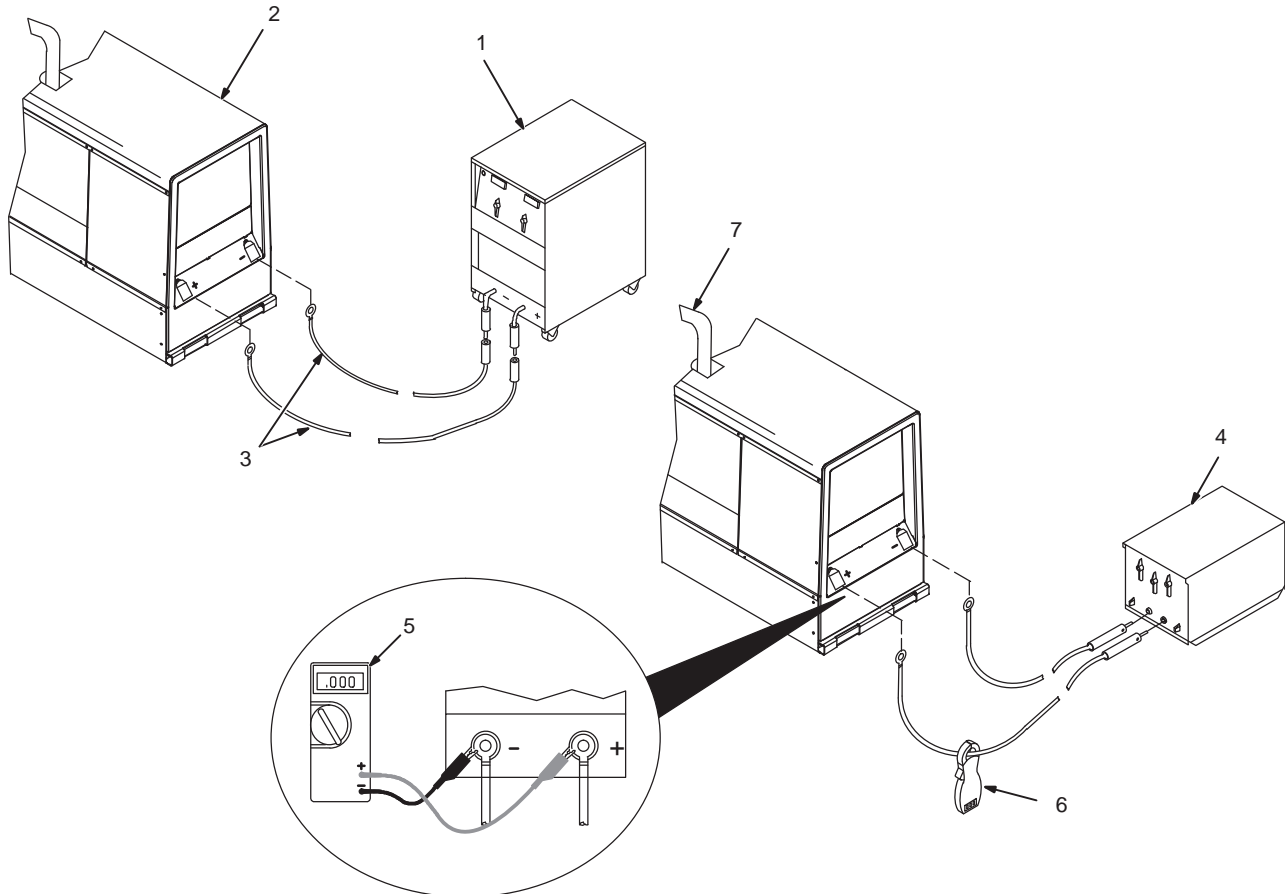
Wetstacking is unburned fuel and oil in the exhaust pipe and occurs during run-in if the engine is run too long at light load or idle rpm.

If exhaust pipe is coated with a wet, black, tar-like substance, dry the engine using one of the following run-in procedures.

See the engine manual for additional engine run-in information.



## 11-2. Run-In Procedure Using Load Bank Or Resistance Grid



**⚠ Stop engine.**

**⚠ Do not touch hot exhaust pipe, engine parts, or load bank/grid.**

**⚠ Keep exhaust and pipe away from flammables.**

**NOTICE** – Do not perform run-in procedure at less than 20 volts weld output and do not exceed duty cycle or equipment damage may occur.

1 Load Bank

Turn all load bank switches Off. If needed, connect load bank to 115 volts AC wall receptacle or generator auxiliary power receptacle.

2 Welder/Generator

Place A/V range switch in maximum position, A/V control in minimum position, and Output Selector switch (if present) in either DC position.

3 Weld Cables

4 Resistance Grid

Use grid sized for generator rated output.

Turn Off grid.

5 Voltmeter

6 Clamp-On Ammeter

Connect voltmeter and ammeter as shown, if not provided on generator.

Start engine and run for several minutes.

### For Load Bank

**Set load bank switches and then adjust generator A/V control so load equals rated voltage and current of generator (see nameplate, rating label, or the specifications section in this manual).**

### For Resistance Grid

**Set grid switches and then adjust generator A/V control so load equals rated voltage and current of the generator (see nameplate, rating label, or the specifications section in this manual).**

Check generator and meters after first five minutes then every fifteen minutes to be sure generator is loaded properly.

**NOTICE** – Check oil level frequently during run-in; add oil if needed.

It is recommended to run the welder/generator for two hours minimum and up to four hours under load. Place A/V control in minimum position, then shut down load bank or grid to remove load. Run engine several minutes at no load.

**⚠ Stop engine and let cool.**

7 Engine Exhaust Pipe

Repeat procedure if wetstacking is present.

# SECTION 12 – GENERATOR POWER GUIDELINES

*The views in this section are intended to be representative of all engine-driven welder/generators. Your unit may differ from those shown.*

## 12-1. Selecting Equipment

- 1 Generator Power Receptacles – Neutral Bonded To Frame
- 2 3-Prong Plug From Case Grounded Equipment

OR

- 3 2-Prong Plug From Double Insulated Equipment

*Be sure equipment has double insulated symbol and/or wording on it.*

**Do not use 2-prong plug unless equipment is double insulated.**

## 12-2. Grounding Generator to Truck or Trailer Frame

- 1 Equipment Grounding Terminal (On Front Panel)
- 2 Grounding Cable (Not Supplied)
- 3 Metal Vehicle Frame

Connect cable from equipment ground terminal to metal vehicle frame. Use #8 AWG or larger insulated copper wire.

*Electrically bond generator frame to vehicle frame by metal-to-metal contact.*

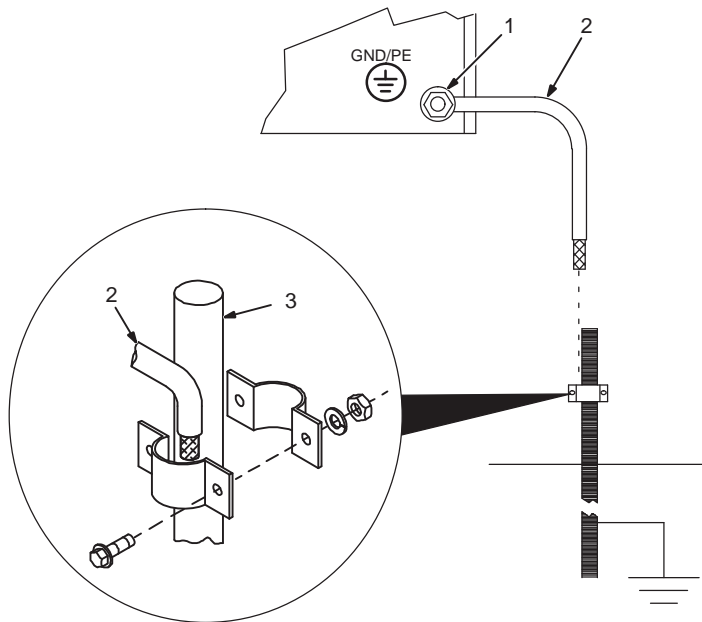
**Always ground generator frame to vehicle frame to prevent electric shock and static electricity hazards.**

**Also see AWS Safety & Health Fact Sheet No. 29, Grounding of Portable And Vehicle Mounted Welding Generators.**

**Bed liners, shipping skids, and some running gear insulate the welding generator from the vehicle frame. Always connect a ground wire from the generator equipment grounding terminal to bare metal on the vehicle frame as shown.**

**Use GFCI protection when operating auxiliary equipment. If unit does not have GFCI receptacles, use GFCI-protected extension cord. Do not use GFCI receptacles to power life support equipment.**

## 12-3. Grounding When Supplying Building Systems



1 Equipment Grounding Terminal

2 Grounding Cable

Use #8 AWG or larger insulated copper wire.

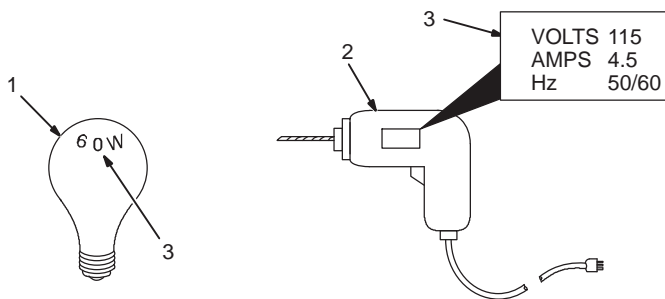
3 Ground Device

Use ground device as stated in electrical codes.

**Ground generator to system earth ground if supplying power to a premises (home, shop, farm) wiring system.**

**Also see AWS Safety & Health Fact Sheet No. 29, Grounding of Portable And Vehicle Mounted Welding Generators.**

## 12-4. How Much Power Does Equipment Require?



1 Resistive Load

A light bulb is a resistive load and requires a constant amount of power.

2 Non-Resistive Load

Equipment with a motor is a non-resistive load and requires approximately six times more power while starting the motor than when running (see Section 12-8).

3 Rating Data

Rating shows volts and amperes, or watts required to run equipment.

**Amperes x Volts = Watts**

**Example 1:** If a drill uses 4.5 amperes at 115 volts, calculate its running power requirement in watts.

$$4.5 \text{ A} \times 115 \text{ V} = 520 \text{ W}$$

The load applied by the drill is 520 watts.

**Example 2:** If three 200 watt flood lamps are used with the drill from Example 1, add the individual loads to calculate total load.

$$(3 \times 200\text{W}) + 520 \text{ W} = 1120 \text{ W}$$

The total load applied by the three flood lamps and drill is 1120 watts.

## 12-5. Approximate Power Requirements For Industrial Motors

Industrial Motors	Rating	Starting Watts	Running Watts
Split Phase	1/8 HP	800	300
	1/6 HP	1225	500
	1/4 HP	1600	600
	1/3 HP	2100	700
	1/2 HP	3175	875
Capacitor Start-Induction Run	1/3 HP	2020	720
	1/2 HP	3075	975
	3/4 HP	4500	1400
	1 HP	6100	1600
	1-1/2 HP	8200	2200
	2 HP	10,550	2850
	3 HP	15,900	3900
Capacitor Start-Capacitor Run	5 HP	23,300	6800
	1-1/2 HP	8100	2000
	7-1/2 HP	35,000	8000
	10 HP	46,700	10,700
Fan Duty	1/8 HP	1000	400
	1/6 HP	1400	550
	1/4 HP	1850	650
	1/3 HP	2400	800
	1/2 HP	3500	1100

## 12-6. Approximate Power Requirements For Farm/Home Equipment

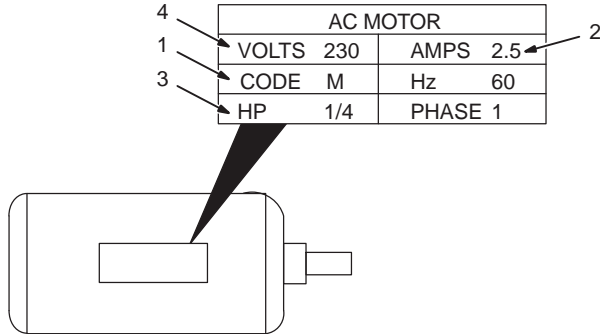
Farm/Home Equipment	Rating	Starting Watts	Running Watts
Stock Tank De-Icer		1000	1000
Grain Cleaner	1/4 HP	1650	650
Portable Conveyor	1/2 HP	3400	1000
Grain Elevator	3/4 HP	4400	1400
Milk Cooler		2900	1100
Milker (Vacuum Pump)	2 HP	10,500	2800
Farm Duty Motors Std. (e.g. Conveyors, Feed Augers, Air Compressors)	1/3 HP	1720	720
	1/2 HP	2575	975
	3/4 HP	4500	1400
	1 HP	6100	1600
	1-1/2 HP	8200	2200
	2 HP	10,550	2850
	3 HP	15,900	3900
Farm Duty Motors High Torque (e.g. Barn Cleaners, Silo Unloaders, Silo Hoists, Bunk Feeders)	5 HP	23,300	6800
	1-1/2 HP	8100	2000
	7-1/2 HP	35,000	8000
	10 HP	46,700	10,700
3-1/2 cu. ft. Mixer	1/2 HP	3300	1000
High Pressure 1.8 Gal/Min	500 PSI	3150	950
Washer 2 Gal/Min	550 PSI	4500	1400
	700 PSI	6100	1600

Farm/Home Equipment	Rating	Starting Watts	Running Watts
Refrigerator or Freezer		3100	800
Shallow Well Pump	1/3 HP	2150	750
	1/2 HP	3100	1000
Sump Pump	1/3 HP	2100	800
	1/2 HP	3200	1050

## 12-7. Approximate Power Requirements For Contractor Equipment

Contractor Equipment	Rating	Starting Watts	Running Watts
Hand Drill	1/4 in.	350	350
	3/8 in.	400	400
	1/2 in.	600	600
Circular Saw	6-1/2 in.	500	500
	7-1/4 in.	900	900
	8-1/4 in.	1400	1400
Table Saw	9 in.	4500	1500
	10 in.	6300	1800
Band Saw	14 in.	2500	1100
Bench Grinder	6 in.	1720	720
	8 in.	3900	1400
	10 in.	5200	1600
Air Compressor	1/2 HP	3000	1000
	1 HP	6000	1500
	1-1/2 HP	8200	2200
	2 HP	10,500	2800
Electric Chain Saw	1-1/2 HP, 12 in.	1100	1100
	2 HP, 14 in.	1100	1100
Electric Trimmer	Standard 9 in.	350	350
	Heavy Duty 12 in.	500	500
Electric Cultivator	1/3 HP	2100	700
Elec. Hedge Trimmer	18 in.	400	400
Flood Lights	HID	125	100
	Metal Halide	313	250
	Mercury	1000	
	Sodium	1400	
	Vapor	1250	1000
Submersible Pump	400 GPH	600	200
Centrifugal Pump	900 GPH	900	500
Floor Polisher	3/4 HP, 16 in.	4500	1400
	1 HP, 20 in.	6100	1600
High Pressure Washer	1/2 HP	3150	950
	3/4 HP	4500	1400
	1 HP	6100	1600
55 gal Drum Mixer	1/4 HP	1900	700
Wet & Dry Vac	1.7 HP	900	900
	2-1/2 HP	1300	1300

## 12-8. Power Required To Start Motor



- 1 Motor Start Code
- 2 Running Amperage
- 3 Motor HP
- 4 Motor Voltage

**Step 1:** Find code and use table to find kVA/HP. If code is not listed, multiply running amperage by six to find starting amperage.

**Step 2:** Find Motor HP and Volts.

**Step 3:** Determine starting amperage (see example).

Welder/generator amperage output must be at least twice the motor's running amperage.

**(kVA/HP x HP x 1000) / Volts = Starting Amperage**

Example: Calculate starting amperage required for a 230 V, 1/4 HP motor with a motor start code of M.

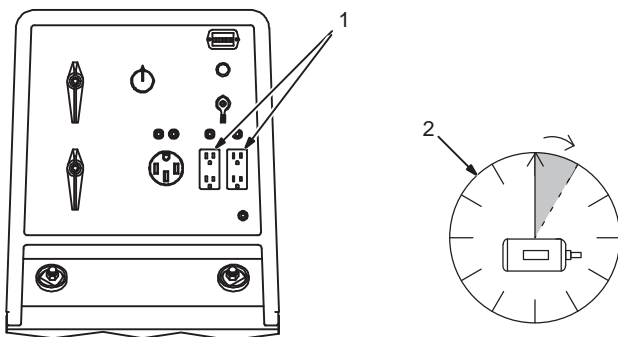
Volts = 230, HP = 1/4, kVA/HP = 11.2

$(11.2 \times 1/4 \times 1000) / 230 = 12.2A$

Starting the motor requires 12.2 amperes.

Single-Phase Induction Motor Starting Requirements								
Motor Start Code	G	H	J	K	L	M	N	P
KVA/HP	6.3	7.1	8.0	9.0	10.0	11.2	12.5	14.0

## 12-9. How Much Power Can Generator Supply?



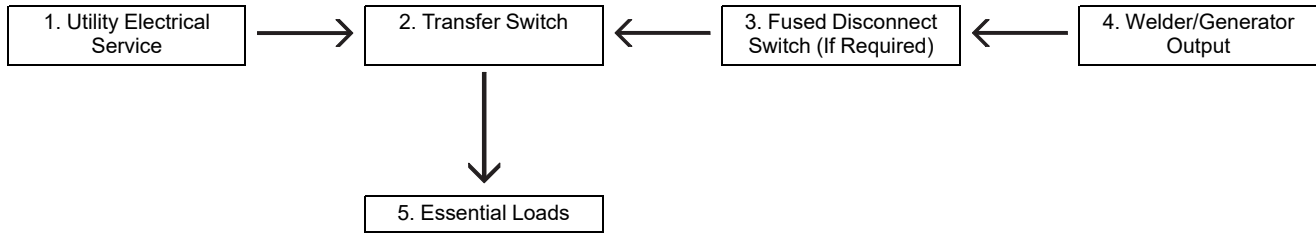
- 1 Limit Load To 90% Of Generator Output

Always start non-resistive (motor) loads in order from largest to smallest, and add resistive loads last.

- 2 5 Second Rule

If motor does not start within 5 seconds, turn off power to prevent motor damage. Motor requires more power than generator can supply.

## 12-10. Typical Connections To Standby Power



**⚠ Have only qualified persons perform these connections according to all applicable codes and safety practices.**

**⚠ Properly install, ground, and operate this equipment according to its Owner's Manual and national, state, and local codes.**

**⚠ Do not connect to any electrical distribution system normally supplied by utility power unless a proper transfer switch and grounding procedure are employed.**

*👉 Customer-supplied equipment is required if generator will supply standby power during emergencies or power outages.*

1 Utility Electrical Service

2 Transfer Switch (Double-Throw)

Switch transfers the electrical load from electric utility service to the generator. Transfer load back to electric utility when service is restored.

Install correct switch (customer-supplied). Switch rating must be same as or greater than the branch overcurrent protection.

3 Fused Disconnect Switch

Install correct switch (customer-supplied) if required by electrical code.

4 Welder/Generator Output

Generator output voltage and wiring must be consistent with regular (utility) system voltage and wiring.

Connect generator with temporary or permanent wiring suitable for the installation.

Turn off or unplug all equipment connected to generator before starting or stopping engine. When starting or stopping, the engine has low speed which causes low voltage and frequency.

5 Essential Loads

Generator output may not meet the electrical requirements of the premises. If generator does not produce enough output to meet all requirements, connect only essential loads (pumps, freezers, heaters, etc. See Section 12-4).

## 12-11. Selecting Extension Cord (Use Shortest Cord Possible)

### A. Cord Lengths For 120 Volt Loads



**⚠ Use GFCI protection when operating auxiliary equipment. If unit does not have GFCI receptacles, use GFCI-protected extension cord. Do not use GFCI receptacles to power life support equipment.**

		Maximum Allowable Cord Length In ft (m) for Conductor Size In AWG (mm <sup>2</sup> )*					
Current (Amperes)	Load (Watts)	4 (25)	6 (16)	8 (10)	10 (6)	12 (4)	14 (2.5)
5	600			350 (106)	225 (68)	137 (42)	100 (30)
7	840		400 (122)	250 (76)	150 (46)	100 (30)	62 (19)
10	1200	400 (122)	275 (84)	175 (53)	112 (34)	62 (19)	50 (15)
15	1800	300 (91)	175 (53)	112 (34)	75 (23)	37 (11)	30 (9)
20	2400	225 (68)	137 (42)	87 (26)	50 (15)	30 (9)	
25	3000	175 (53)	112 (34)	62 (19)	37 (11)		
30	3600	150 (46)	87 (26)	50 (15)	37 (11)		
35	4200	125 (38)	75 (23)	50 (15)			
40	4800	112 (34)	62 (19)	37 (11)			
45	5400	100 (30)	62 (19)				
50	6000	87 (26)	50 (15)				

\*Conductor size is based on maximum 2% voltage drop.

### B. Cord Lengths For 240 Volt Loads



**⚠ Use GFCI protection when operating auxiliary equipment. If unit does not have GFCI receptacles, use GFCI-protected extension cord. Do not use GFCI receptacles to power life support equipment.**

		Maximum Allowable Cord Length In ft (m) for Conductor Size In AWG (mm <sup>2</sup> )*					
Current (Amperes)	Load (Watts)	4 (25)	6 (16)	8 (10)	10 (6)	12 (4)	14 (2.5)
5	1200			700 (213)	450 (137)	225 (84)	200 (61)
7	1680		800 (244)	500 (152)	300 (91)	200 (61)	125 (38)
10	2400	800 (244)	550 (168)	350 (107)	225 (69)	125 (38)	100 (31)
15	3600	600 (183)	350 (107)	225 (69)	150 (46)	75 (23)	60 (18)
20	4800	450 (137)	275 (84)	175 (53)	100 (31)	60 (18)	
25	6000	350 (107)	225 (69)	125 (38)	75 (23)		
30	7000	300 (91)	175 (53)	100 (31)	75 (23)		
35	8400	250 (76)	150 (46)	100 (31)			
40	9600	225 (69)	125 (38)	75 (23)			
45	10,800	200 (61)	125 (38)				
50	12,000	175 (53)	100 (31)				

\*Conductor size is based on maximum 2% voltage drop.







# TRUE BLUE<sup>®</sup>

## WARRANTY

Effective January 1, 2020

(Equipment with a serial number preface of NA or newer)

This limited warranty supersedes all previous Miller warranties and is exclusive with no other guarantees or warranties expressed or implied.

**LIMITED WARRANTY** – Subject to the terms and conditions below, Miller Electric Mfg. LLC, Appleton, Wisconsin, warrants to authorized distributors that new Miller equipment sold after the effective date of this limited warranty is free of defects in material and workmanship at the time it is shipped by Miller. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.

Within the warranty periods listed below, Miller will repair or replace any warranted parts or components that fail due to such defects in material or workmanship. Miller must be notified in writing within thirty (30) days of such defect or failure, at which time Miller will provide instructions on the warranty claim procedures to be followed. Notifications submitted as online warranty claims must provide detailed descriptions of the fault and troubleshooting steps taken to diagnose failed parts. Warranty claims that lack the required information as defined in the Miller Service Operation Guide (SOG) may be denied by Miller.

Miller shall honor warranty claims on warranted equipment listed below in the event of a defect within the warranty coverage time periods listed below. Warranty time periods start on the delivery date of the equipment to the end-user purchaser, or 12 months after the equipment is shipped to a North American distributor, or 18 months after the equipment is shipped to an international distributor, whichever occurs first.

1. 5 Years Parts — 3 Years Labor
  - \* Original Main Power Rectifiers Only to Include SCRs, Diodes, and Discrete Rectifier Modules
2. 3 Years — Parts and Labor Unless Specified
  - \* Auto-Darkening Helmet Lenses (No Labor) (See Classic Series Exception Below)
  - \* Engine Driven Welder/Generators  
**(NOTE: Engines are Warranted Separately by the Engine Manufacturer.)**
  - \* Insight Welding Intelligence Products (Except External Sensors)
  - \* Inverter Power Sources
  - \* Plasma Arc Cutting Power Sources
  - \* Process Controllers
  - \* Semi-Automatic and Automatic Wire Feeders
  - \* Transformer/Rectifier Power Sources
3. 2 Years — Parts and Labor
  - \* Auto-Darkening Helmet Lenses – Classic Series Only (No Labor)
  - \* Auto-Darkening Weld Masks (No Labor)
  - \* Fume Extractors – Capture 5, Filtair 400 and Industrial Collector Series
4. 1 Year — Parts and Labor Unless Specified
  - \* ArcReach Heater
  - \* AugmentedArc and LiveArc Welding Systems
  - \* Automatic Motion Devices
  - \* Bernard BTB Air-Cooled MIG Guns (No Labor)
  - \* CoolBelt (No Labor)
  - \* Desiccant Air Dryer System
  - \* Field Options  
**(NOTE: Field options are covered for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)**
  - \* RFCS Foot Controls (Except RFCS-RJ45)
  - \* Fume Extractors – Filtair 130, MWX and SWX Series, ZoneFlow Extraction Arms and Motor Control Box HF Units
  - \* ICE/XT Plasma Cutting Torches (No Labor)
  - \* Induction Heating Power Sources, Coolers  
**(NOTE: Digital Recorders are Warranted Separately by the Manufacturer.)**
  - \* Load Banks
  - \* Motor-Driven Guns (except Spoolmate Spoolguns)
  - \* PAPR Blower Unit (No Labor)
  - \* Positioners and Controllers
  - \* Racks (For Housing Multiple Power Sources)
  - \* Running Gear/Trailers
  - \* Subarc Wire Drive Assemblies

- \* Supplied Air Respirator (SAR) Boxes and Panels
  - \* TIG Torches (No Labor)
  - \* Tregaskiss Guns (No Labor)
  - \* Water Cooling Systems
  - \* Wireless Remote Foot/Hand Controls and Receivers
  - \* Work Stations/Weld Tables (No Labor)
5. 6 Months — Parts
    - \* Batteries
  6. 90 Days — Parts
    - \* Accessories (Kits)
    - \* ArcReach Heater Quick Wrap and Air Cooled Cables
    - \* Canvas Covers
    - \* Induction Heating Coils and Blankets, Cables, and Non-Electronic Controls
    - \* MDX Series MIG Guns
    - \* M-Guns
    - \* MIG Guns, Subarc (SAW) Torches, and External Cladding Heads
    - \* Remote Controls and RFCS-RJ45
    - \* Replacement Parts (No labor)
    - \* Spoolmate Spoolguns

Miller's True Blue<sup>®</sup> Limited Warranty shall not apply to:

1. **Consumable components; such as contact tips, cutting nozzles, contactors, brushes, relays, work station table tops and welding curtains, or parts that fail due to normal wear. (Exception: brushes and relays are covered on all engine-driven products.)**
2. Items furnished by Miller, but manufactured by others, such as engines or trade accessories. These items are covered by the manufacturer's warranty, if any.
3. Equipment that has been modified by any party other than Miller, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.
4. Defects caused by accident, unauthorized repair, or improper testing.

MILLER PRODUCTS ARE INTENDED FOR COMMERCIAL AND INDUSTRIAL USERS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT.

The exclusive remedies for warranty claims are, at Miller's option, either: (1) repair; or (2) replacement; or, if approved in writing by Miller, (3) the pre-approved cost of repair or replacement at an authorized Miller service station; or (4) payment of or credit for the purchase price (less reasonable depreciation based upon use). Products may not be returned without Miller's written approval. Return shipment shall be at customer's risk and expense.

The above remedies are F.O.B. Appleton, WI, or Miller's authorized service facility. Transportation and freight are the customer's responsibility. TO THE EXTENT PERMITTED BY LAW, THE REMEDIES HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES REGARDLESS OF THE LEGAL THEORY. IN NO EVENT SHALL MILLER BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT) REGARDLESS OF THE LEGAL THEORY. ANY WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTY, OR REPRESENTATION, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE, ARE EXCLUDED AND DISCLAIMED BY MILLER.

Some US states do not allow limiting the duration of an implied warranty or the exclusion of certain damages, so the above limitations may not apply to you. This warranty provides specific legal rights, and other rights may be available depending on your state. In Canada, some provinces provide additional warranties or remedies, and to the extent the law prohibits their waiver, the limitations set out above may not apply. This Limited Warranty provides specific legal rights, and other rights may be available, but may vary by province.

### Warranty Questions?

Call  
1-800-4-A-MILLER  
for your local  
Miller distributor.

Your distributor also gives  
you ...

### Service

You always get the fast,  
reliable response you  
need. Most replacement  
parts can be in your  
hands in 24 hours.

### Support

Need fast answers to the  
tough welding questions?  
Contact your distributor.  
The expertise of the  
distributor and Miller is  
there to help you, every  
step of the way.



# Owner's Record

Please complete and retain with your personal records.

Model Name \_\_\_\_\_ Serial/Style Number \_\_\_\_\_

Purchase Date \_\_\_\_\_ (Date which equipment was delivered to original customer.) \_\_\_\_\_

Distributor \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_ Zip \_\_\_\_\_

Register your product at [www.MillerWelds.com/Register](http://www.MillerWelds.com/Register)

## For Service

**Contact a DISTRIBUTOR or SERVICE AGENCY near you.**

Always provide Model Name and Serial/Style Number.

Contact your Distributor for:

- Welding Supplies and Consumables
- Options and Accessories
- Personal Protective Equipment (PPE)
- Service and Repair
- Replacement Parts
- Training (Schools, Videos, Books)
- Welding Process Handbooks

To locate a Distributor or Service Agency visit [www.millerwelds.com](http://www.millerwelds.com) or call 1-800-4-A-Miller

Contact the Delivering Carrier to:

File a claim for loss or damage during shipment.

For assistance in filing or settling claims, contact your distributor and/or equipment manufacturer's Transportation Department.

### Miller Electric Mfg. LLC

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Appleton, WI 54914 USA

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[www.MillerWelds.com](http://www.MillerWelds.com)

